Personal Computer World

www.pcw.vnu.co.uk

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VNU Business Publications

No-nonsense Buyers Guide p336

EVERYTHING YOU NEED UNDER ONE COVER | Jan 1997 | £2.95

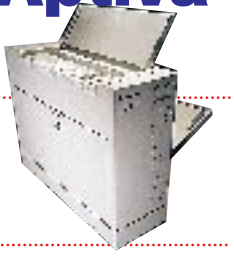
Ultimate Home PCs

Power & Style for '97

EXCLUSIVE!

IBM's new Aptiva

Full review inside



Laser Wars

12-printer battle

Group Tests

3D Graphics Cards
CAD Tools

New Products:

Fractal Expressions
Acrobat 3.0, Ventura 7
cc:Mail 6
Taxan
Flatscreen

On this month's CD
COMPLETE WEB SERVER

Exclusive!
NETOBJECTS - DTP FOR THE WEB

9 770142 023069 01

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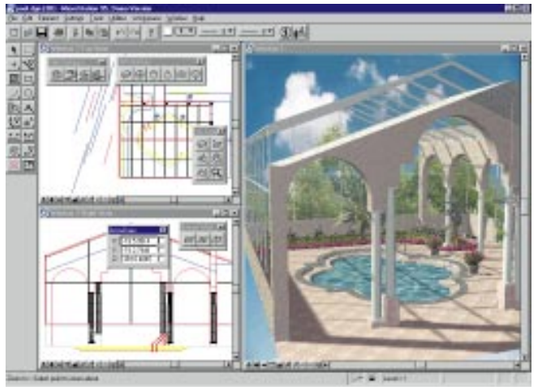
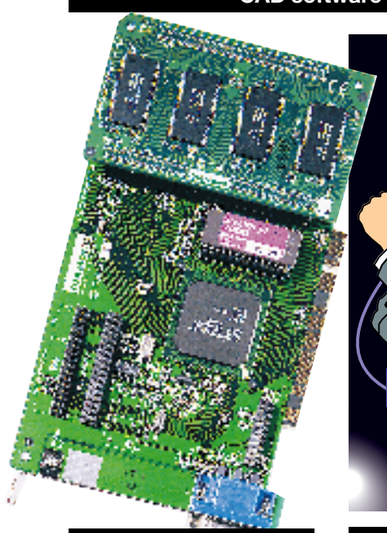


CAD software p116



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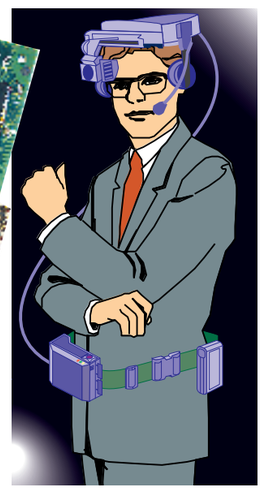

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Leisure Lines

CompuServe Competition

Win ten free flights with CompuServe and Air UK.
See page 20 for full details.

AirUK

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Regulars

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Hands On

Direct Buyers' World

The place in *PCW* where you can compare prices on a wide range of hardware and software. The card insert at page 357 marks the start of the section.

Our Product Locator, on page 539, lists advertisers by product category, making it easier to find what you're looking for.

Personal Computer World

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Editorial

One of this month's group tests turns its attention to PCs for the home (p190) and it seems we are at the start of a new era in home computing. There was a time when, if you wanted a PC for the home, it looked pretty much like the one you used in the office: beige, square and ugly. Hardly the stuff to give Bang & Olufsen cause for concern.

But times change, and manufacturers are at last designing PCs for the home that really look like they belong. IBM, in developing the new Aptiva S-Series, went into people's homes to see just how they used PCs in a domestic situation and found that home users were forced to adapt to the PCs, rather than the other way round. It seems that the research was worth it. After reading our evaluation of the new Aptiva, on page 196, I think you'll agree that it's a significant step forward in PC design.

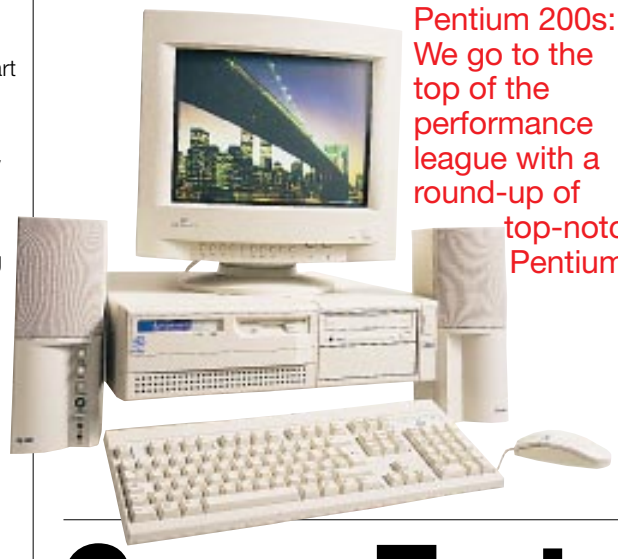
But it won't stop there. 1997 sees the arrival, on our shores, of the radical Toshiba Infinia series which evolves the PC into a slick home entertainment system. It's already winning plaudits in America. Waiting in the wings are new designs from Compaq, Acer and Packard Bell. And importantly, these new systems are also powerful business computing devices for the home office units — not just for playing games or surfing the net. Your home deserves good design, and at last the leading PC vendors are starting to wake up to that fact. By the end of next year, any vendor serious about selling PCs into homes should have taken heed of the style leaders.

Meanwhile, *PCW* also enters the new year in better shape, with more reviews, more group tests and more staff than ever before. This means you can look forward to unrivalled coverage of the whole world of computing in what are fast-changing times. Which is good news for you and bad news for our rivals. Happy New Year!

PJ Fisher

Managing Editor

Next Month



Pentium 200s: We go to the top of the performance league with a round-up of top-notch Pentiums

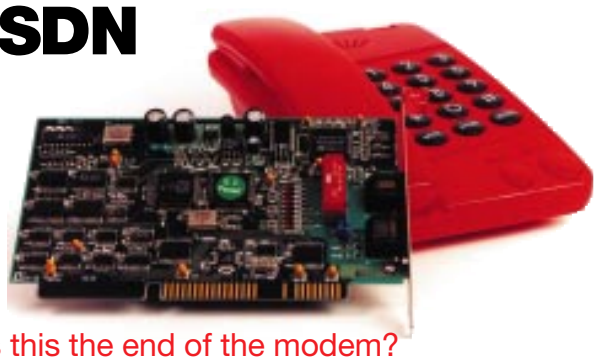
Group Test

Digital Cameras

An imaging revolution is on the way. *PCW* calls the shots in a comprehensive group test

Plus...

ISDN



Is this the end of the modem?

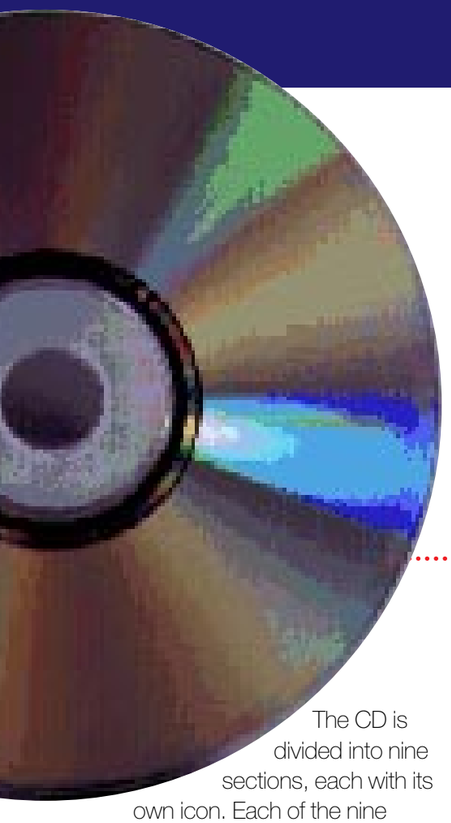
What is DVD?

The technology behind the super-CD

February 97 issue
- On sale Thursday 2nd January

March 97 issue
- On sale Thursday 6th February

** Next month's contents subject to change.*

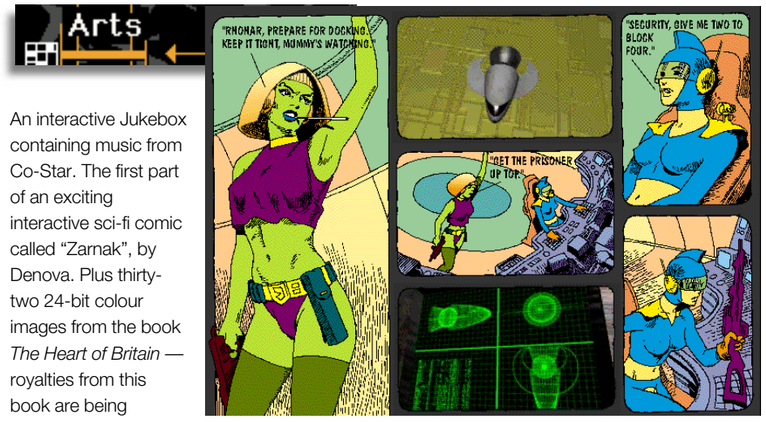


Personal Computer World

January
Cover disc

Welcome to issue 5 of our new-look *PCW* CD-ROM cover disc. This month, we present more than 600Mb of games, multimedia, music, images and PC tips for you to enjoy.

The CD is divided into nine sections, each with its own icon. Each of the nine section buttons is almost always visible on-screen so you can move from section to section just by clicking on that button, rather than having to continually return to a home page. If you are not sure where each section is, roll over the buttons, and the name of that section will be displayed, along with a contents list of the section. Exit the disc by clicking on the "Q" in the bottom left of the screen.

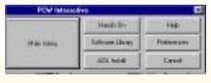


Will Rhohar "keep it tight"?… and will Mummy actually be watching when she does? All will be revealed, interactively, in Part I of Zarnak

Arts

An interactive Jukebox containing music from Co-Star. The first part of an exciting interactive sci-fi comic called "Zarnak", by Denova. Plus thirty-two 24-bit colour images from the book *The Heart of Britain* — royalties from this book are being donated to the Royal Brompton Hospital.

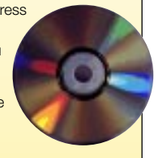
How to use the CD-ROM



1. Quit existing applications.

2. Put the disc into your CD-ROM drive.

3. Win 95: If you've got Windows 95, the *PCW* interactive loader will appear on your screen. If your CD doesn't auto-load, start Windows Explorer and double-click PCW.exe.
Win 3.1: From Windows Program Manager choose File/Run, then type in <CD Drive>:\PCW.exe and press enter.



4. Click on main menu. If you don't have Quicktime for Windows and Video for Windows installed, you will be offered the chance to install them before continuing.

Hardware requirements

To run the CD-ROM, you need a PC with Windows 3.1 or later and a colour VGA display. We recommend a multimedia 486 or Pentium PC with a minimum 8Mb of RAM. The optimum configuration is a 16Mb Pentium.

Possible CD-ROM problems

1. If you have launched Acrobat reader in the Hands On section and cannot find the search icon that is described in the first page of notes, this may be because you already have a copy of Acrobat reader on your C: drive, so the autostart for this cover disc is not asking you to install our version which includes the search facilities. You can either delete your Acrobat reader from the C: drive, or change its name and run PCW.EXE again, which this time should ask you to install the Acrobat reader with search facilities.

2. If you get a message such as "Not ready reading drive D:", you may have a dud CD.

Return the disc to: TIB House, 11 Edward Street, Bradford, DB4 7BH, for a free replacement.

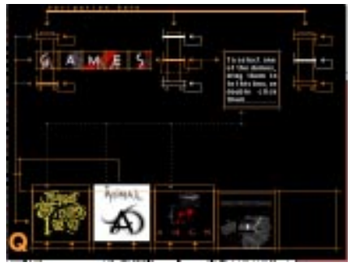
■ For other problems concerning the CD, call 0891 715929. Calls cost 39p/minute off-peak and 49p at all other times.

CD Index

A searchable database of the *PCW* cover disk contents since September 1996.

Games

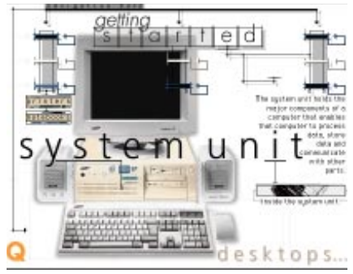
Great games to keep you entertained



Here, you can preview four games on this month's CD. You can play some games right away but you'll need to install others first. Some you can only play from DOS.

Getting Started

A beginner's interactive guide to printers and desktop PCs.

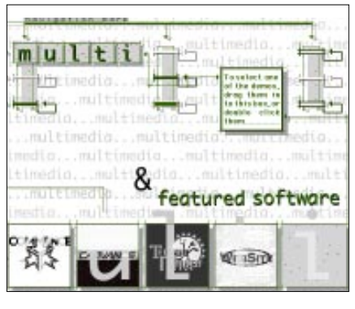


Hands on

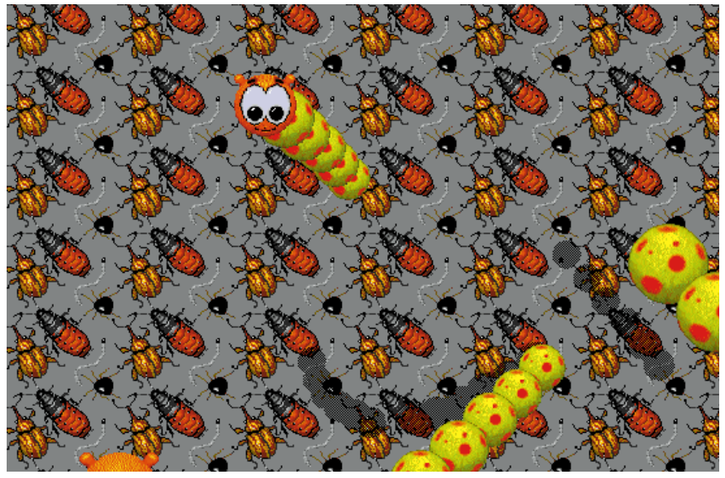
Install and launch the Acrobat reader to view and search *PCW Hands On* articles from the past year.

All the regulars are here in a year's *Hands On*

Multimedia



Floppy disk



Just one of the ten screensavers on this month's floppy disk

This month's floppy disk contains a shareware screensaver program for Windows, called Mez. It includes ten screen savers and 60 tiles for your desktop. This demo of Mez is fully functional (and has no irritating messages).

■ To install Mez onto your desktop from the floppy disk, insert the floppy into the drive:
Windows 95 — Click on START\RUN from the taskbar. Type into the box a:\PCWJAN97.EXE then click OK.
Win3.11 — Go to FILE\RUN on PROGRAM MANAGER. Type into the box a:\PCWJAN97.EXE then click OK.

■ To install Mez from the CD:
From Windows Explorer, or File Manager, double-click on PCWJan97.exe in the directory <CD Drive>/FLOPPY/

This will unpack the compressed file, run the Mez installation program and tidy up afterwards, too.

Possible problems with the floppy

■ If you have problems with the floppy, such as a message "cannot read from drive a:", please return the disk to TIB plc, TIB House, 11 Edward Street, Bradford BD4 7BH, together with a SAE and two 25p stamps. Where it is a duplication fault, the postage will be returned with your replacement disk. TIB is on 01274 736990.

■ Our floppy-disk hotline is available on weekdays from 10.30am - 4.30pm on 0891 715929.

■ *PCW* cover disks are thoroughly virus checked, but *PCW* cannot accept liability for problems arising from use of the disk.

You are advised not to install any software on a networked PC without having checked it first.

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COMPETITION

Jet Away with CompuServe **and** Air UK

Already fed up with Christmas? Take heart! CompuServe has teamed up with Air UK to offer *PCW* readers the chance to win a pair of return tickets to one of more than 30 European destinations on the Air UK network. We have ten pairs to give away. (Further details are available online).

How to enter

If you are already a CompuServe member just follow the instructions detailed in our *Questions* section. If you are not a CompuServe member already, don't worry! You can use the newly-released version of CompuServe's software, on this month's cover, to sign up and enter the competition. Get your first month's membership *free* with ten hours' *free** online time. To install the software, follow the instructions on your CD-ROM wallet and, when prompted, insert the Offer code printed on the rear. In just a few minutes your membership will be confirmed and you will be online. To find out more about the world of CompuServe, take a look at the Interactive Tour on the CD.

CompuServe 3.0 — the brand new interface

Find all the answers at Air UK's web site

** (Access CompuServe via a local call from anywhere in the UK. A communications surcharge applies if you access via GNS DialPlus. Premium Services [indicated with a P$] carry a surcharge and free online time does not apply when using these.).*

The Prizes

Ten lucky *PCW* readers will win a pair of return tickets to the European destination of their choice on the Air UK Network between 1st March, 1997 and 28th February, 1998 (excluding flights on or within two days of a public holiday).

Questions

Once you are online, type PCWQUIZ at the GO command and follow the instructions. You will be asked the questions below (and to provide your membership ID details). The answers can be found at Air UK's web site (www.airuk.co.uk/) and querying their flight schedules and airport information.

1. What is the flight number of the plane that leaves London Stansted airport at 9.20am on Saturdays, arriving in Florence at 12.45pm between 28th October, 1996 and 29th March 1997?
   a) UK 963 b) UK 918 c) UK 923
2. How many short-stay car parking spaces are there at Stansted airport?
   a) 1,500 b) 2,000 c) 2,500

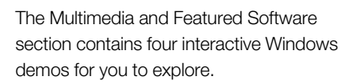
Tie-breaker

If you could fly a plane, where would you fly to and why? (Answers restricted to 100 characters).

Competition rules

1. All entries must be made online. Type PCWQUIZ at the GO command. Entries submitted via any other media will not be accepted. **2.** GO PCWQUIZ is a free service, but normal telephone charges apply. A communications surcharge will apply if you access via GNS DialPlus. **3.** If you stay online beyond your first month, subsequent months are charged at £6.50 per month with five hours' free online time each month. If you stay online beyond your free usage time you will be charged £1.95 per hour. You can access CompuServe via a local call from anywhere in the UK. Premium Services (indicated with a P$) carry a surcharge and free online time does not apply when using these. **4.** This competition is only open to UK CompuServe members. Employees of CompuServe worldwide, VNU Business Publications Ltd and participating suppliers, are expressly excluded. **5.** Entries are strictly limited to one per member. **6.** The ten prize-winners will be selected from those email entries with questions 1 and 2 entered correctly and who, in the sole opinion of the judges, have submitted the most witty and original tie-breakers. **7.** The judges' decision is final and no correspondence will be entered into. **8.** All prize winners will be notified by email or by post. **9.** The closing date for entries is 31st January, 1996. All prize winners will be notified by 28th February. **10.** Proof of submission of entry is not deemed to be proof of receipt. **11.** There is no cash alternative to any of these prizes. **12.** The destinations included on the Air UK Network are correct at the time of going to press but may be subject to change. **13.** By submitting an entry, entrants will be deemed to have read and understood the rules and be bound by them.

The Multimedia and Featured Software section contains four interactive Windows demos for you to explore.



PCW reviews index, advertisers' index, glossary and general info about the CD.

Browse through VNU's web e-zine. Play with the interactive radio.

Browse through VNU's new e-zine, even if you're not on the web

A library of shareware, utilities and drivers, each with a brief description which can be copied onto your hard disk, using the Netscape browser.

Multimedia & Featured Software

To preview any of the multimedia demonstrations, either drag one of the images along the bottom into the box in the top right corner, or double-click one of those images.

Commence A package which utilises state-of-the-art email, internet, paging and remote replication technologies. This demo is the same as the full version, minus the network capabilities.

CADvance A complete integration of CAD with other applications in the Windows environment.

Technomaker A sample sequencer.

Create your own web-site server with this free package

WebSite1.1 Complete Web Server A package that lets you create your own web-site server. This copy of O'Reilly & Associates WebSite 1.1 is a fully working version of one of the world's best web servers and is worth over £180. It is not timed-out and is yours free to use. However, you are not entitled to technical support from O'Reilly & Associates or a reduced cost upgrade to WebSite Professional, but WebSite 1.1 is one of the easiest web servers to set up and use. Full Online Help is included, to get you started. You can use WebSite to set up your own company intranet or serve web pages to the internet and it is ideal for small to medium-sized businesses and groups. WebSite runs on Windows NT 3.5 (or higher) and Windows 95 only and requires 12Mb RAM (min), 5Mb of HD space plus TCP/IP connectivity.

Fast Track

If you would prefer to play or install the Games and Multimedia demos from outside the main *PCW* interface, or want to know the location of the Resources homepage (in order to use your own internet browser rather than the default Netscape browser), click on the HELP button on the *PCW* loader. This help\info file also contains the locations of other things on the disk, along with a full contents list and help tips.

Check out O'Reilly & Associates excellent range of books and software for computer professionals in their 1997 catalogue (www.ora.com), also on our cover CD in Acrobat format, and order now for Christmas. To view the catalogue, launch Acrobat then go to file/open and double-click <CD Drive>:\catalog.PDF

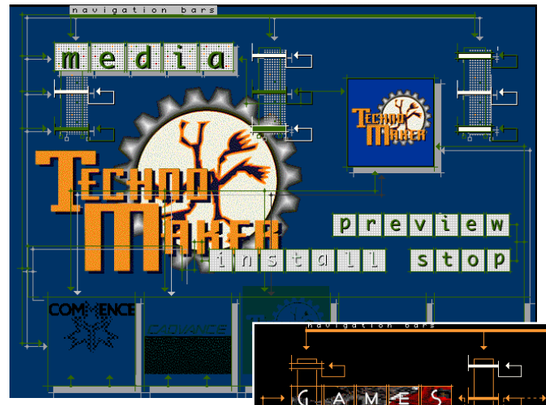
Games

To preview any of the games, drag one of the images along the bottom into the box in the top right corner or double-click one of those images.

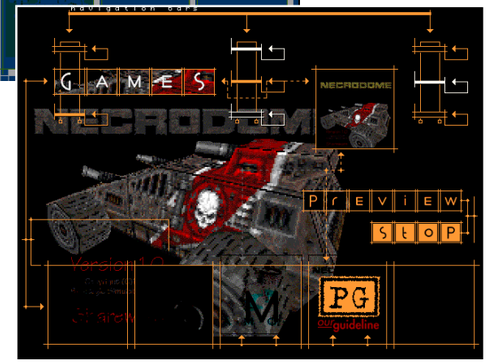
The Muppets Treasure Island Aimed at a lower age range, this interactive adventure still manages to include all the Muppet mayhem we expect and love.

Animal At last, the outrageous Peperami stars in his very own computer game. Using guile, cunning and *raw violence*, he must solve the mystery of Pepereinstein's kidnapping,

Interactive Muppet madness to keep the kids occupied



Left Technomaker. A sample sequencer for solid sounds



Below Enter the Necrodome at your peril. There's no such thing as a good loser in this deadly sport.

Please note: The demos featured in the Games and Multimedia sections can be previewed and some will run from the PCW main interface. However, due to technical issues concerning the software supplied to us, some demos will not run alongside the interface and others require installation to your hard disk.

p22 ➢

in this point-and-click adventure.

Amok This fast-paced shooter puts you in control of a hi-tech battle mech on one of many pre-determined suicidal missions. Amok offers the gamer many hours of thrills and excitement. (*Sorry, Win 3.x users, this game is Win95 only*).

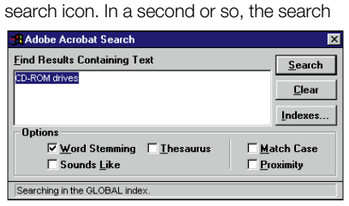
Necrodome Enter a future where sport has turned deadly. You drive heavily-armed vehicles against opponents in 15 different arenas in an attempt to remain victorious. (*Sorry, Win 3.x users, this game is Win95 only*).

● *Please note: The Necrodome installer may take a while to load — please be patient.*

Using the Hands On section

Load Acrobat either by selecting Hands On from the launch menu or by going into the Hands On section of the main menu.

To search Acrobat files, just click on the icon. A dialogue will appear. Just type in the word you want to search for and click the search icon. In a second or so, the search



Just type in the word you want to search for — in our case, CD-ROM

In a second or two, a list of all the files containing that word will appear

results dialogue will appear containing a list of the files containing that word.

You can then view any of the files. The word you search for (CD-ROM drives in our example) is highlighted. On average-sized monitors the text will be greeked but you can use the magnifying glass icon to expand the text. Just click on the icon, then select the area of the page you want to magnify, with your mouse.

The default index for the Acrobat files is a global search of all files. You should find the global search sufficiently fast. If you're looking for a very common word however, such as "Windows", you may want to narrow the search. To do this, click on the indexes button in the search dialogue then click add, and add any additional indexes which have the prefix PDX and are located in <CD Drive>\ACROFILE\PCWPDF\

Using the Software Library section

The files in this section are copied to your hard disk using the default Netscape browser on the CD. If you already have your own frames-compatible browser installed and want to access the resources section, run your browser, go to File Open and open D:\html\res\resource.htm

■ **Compressed Zip files or self-extracting archives**

Most files in this section are compressed Zip files or self-extracting archives. Click on the file that you would like to copy to your hard disk. A box will appear, stating the name of the file to copy and the destination directory. Click on OK . If you're using the default browser, you will be given the option of:

1. Copy the file only, from the CD to a chosen destination, with no further action
2. Decompress the files contained in the archive into the destination of your choice

By selecting both of the above you can copy the file *and* decompress it into your chosen location.

If you have to abort the copy, and subsequent attempts to download the same file give an unexpected filename, go to c:\vnu\netscape and delete the copy of the file contained therein. Next time you click on the hypertext link, the transfer should work OK.

■ **Other file types**

Click on the file that you would like to copy to your hard disk. This will bring up the "save as" dialogue box. Choose where you want to copy the file (make sure you don't try to copy the file to the CD itself, or you will get an error message). It's a good idea to create a directory or folder for it first (using Windows File Manager or Explorer).

Note: *Avoid copying any of the resources files into your Windows directory or into the root of your C: drive.*

Using Netscape

The *Personal Computer World* Interactive CD-ROM uses Netscape as the delivery mechanism for the resources section and to run the Room e-zine.

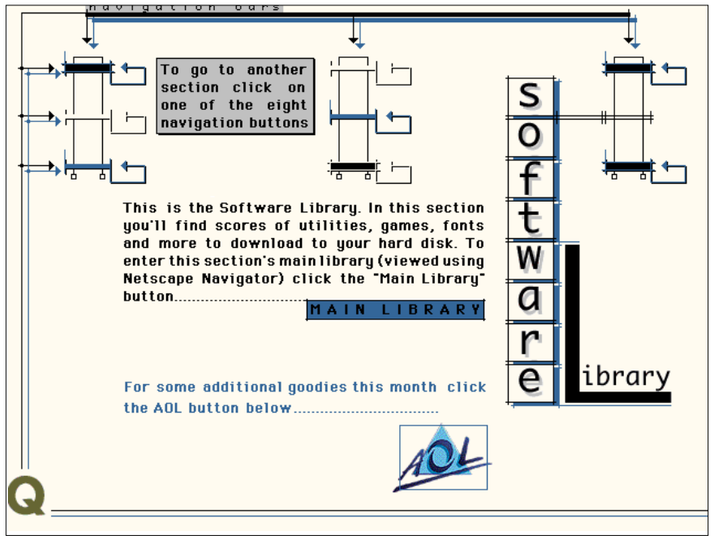
If you're on the internet, chances are you're already using Netscape and have a rough idea how it works. If you're not, this provides a great opportunity to find out what this browser business is all about.

You navigate through web (or HTML) pages using hyperlinks. These are images or, more often, highlighted text which take you backwards and forwards through different pages. You can also move back and forth through pages you've already visited by using the back and forward arrows on the toolbar.

Netscape 2.0 has a feature called "frames" which divides the screen into separate areas. When using frames, the right mouse button, rather than the arrow keys, is used to move backwards and forwards.

When using Netscape from within *PCW* Interactive you'll need to go to File/Exit to return to the main screen.

All the goodies are here. From our *Hands On* section files, to Flying Tigers, from a Porsche screensaver to Netscape Navigator, Acrobat Reader and lots more — something for everyone



Installing PKUnzip or Winzip

Zip files are the standard compression format for distributing programs and utilities on the web and on floppy disk. If you choose to copy the resources zip files on to your hard disk and decompress them later, you will need to install PKUnzip or Winzip before you can "unzip" them. Go to the Essential Utilities section and click the link "PKZip/PKUnzip" or "Winzip".

■ **Winzip:** choose Winzip and a new page will appear offering you Winzip for Win95 and Winzip for Windows 3.11. Select the appropriate platform and save it to a location of your choice. If you have less than 16Mb of RAM it's probably a good idea to quit Navigator and the *PCW* CD next. Then use File Manager or Explorer to find Winzip95.exe or wz60wn16.exe.

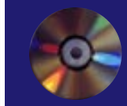
■ **PKUnzip:** choose PKUnzip and save pkz204g.exe onto your hard disk — the C:\DOS\ folder is as good a place as any to save it. After you've quit Navigator and the *PCW* CD, double-click on the file to expand it to 16 separate files (if you have chosen not to decompress and save it to your HD in one action).

■ **Associating the file:** unless you intend to use DOS to unzip files (laborious and tricky) you need to associate .zip files with PKUnzip. From File Manager, choose File Associate to associate *.zip files with PKUNZIP.EXE. Under Windows 95, zip files will be associated automatically.

On next month's CD

Realms of the Haunting — 100Mb demo of Gremlin Interactive's new supergame.

January 1997



PCW INTERACTIVE

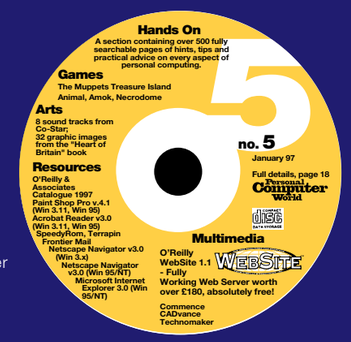
Entire Contents List:

Multimedia section
- CADvance
- Commence
- Technomaker
- WebSite 1.1 Complete Web Server

Games section
- Amok (Win95 only)
- Animal
- Muppets Treasure Island
- Necrodome (Win95 only)

Arts section
- *Heart of Britain* — 32 graphic images from the book
- Jukebox — music from Co-Star
- Zarnak (pt 1) — new interactive sci-fi comic

Getting Started
- A beginner's interactive exploration of notebooks, printers and desktop PCs



Personal Computer World

CD Index
- A searchable index of the *PCW* cover disks since Sept '96

Hands on
- Hints, tips and practical advice on every aspect of personal computing

The Room
- A browse through VNU's new e-zine

F O L D H E R E

Reference section
- 15-month products and features archivable database
- Advertisers index
- General info about the CD
- Glossary of PC terms

Software library section
Including those files referred to in our *Hands On* section
- **Acrobat Reader v3.0** (Win95/Win 3.11)
- Anim8
- Avery Label templates
- Cachchk
- Chain Reaction
- Chameleon
- Chess
- Commander Keen 4
- CV Author
- Cyberpuck
- Flash View
- Flying Tigers
- Focus Picture Library — 16 downloadable images
- Font Presenter
- Frontier Mail
- Global Positioning System software
- *Heart of Britain* — 32 downloadable images
- Help Maker Plus
- Home Finance
- **Internet Explorer 3.0** (Win95/NT)
- Kids' Icons
- Klik-N-View Business Cards
- Magic Crayon 4.0
- MicroAngelo v2.1
- **Netscape Navigator v3.0** (Win 3.x/Win95/NT)
- Ornamatica — the masterpiece border-maker
- **Paint Shop Pro v4.1** (Win3.11/Win95)
- PKZIP & PKUnzip
- Plastic Morph
- Ponger
- Ponger 32
- Porsche Screensaver
- Prosound
- Quake v1.01
- **SpeedyRom**
- Tardis for Windows
- Tardis 95
- Terrapin
- ThunderBYTE Anti-Virus (Win95/Win 3.x)
- VBRun 100, 200, 300, 400.dll
- Video for Windows
- *What PC?* — mobile pages buyers' guide for Psion 3a incl. the new Nicholson London Pages
- Wincode
- Win95 service pack 1
- Winzip
- Yahoo! News Ticker

Wanted: material for *PCW* cover CD-ROMs

We are always on the lookout for material for our cover-mounted CD-ROMs. If you think that you have something that might be suitable such as software, pictures, fonts, demos and so on, please let us know: email Steven Rogers at stevenr@vnu.co.uk or write to him at CD Development, New Media, VNU Business Publications Ltd, 32-34 Broadwick Street, London W1A 2HG. *Please note that Steve cannot deal with technical support.*

Newsprint

Edited by Clive Akass.
Send your news and views to news@pcw.vnu.co.uk

CE palmtops unveiled

■ Six manufacturers showed palmtops using cut-down Windows CE at Comdex. The hardware, from Casio, Compaq, Hitachi, LG Goldstar, NEC and (*pictured*) Philips, offered little new: a calculator-size keyboard, mono touch-screens. All offer easy PC connectivity with file synchronisation. Some offer web access but CE does not support Microsoft's Active X. Prices start at £300 (plus VAT). *See p45*.

400Kb satellite net link

A new satellite service offers fast web access at prices that could soon hit consumer level. The DirecPC service, from Hughes Olivetti Telecom (HOT), delivers up to 400Kb/sec one way (two ISDN lines provide 128Kb/sec duplex).

The primary use is to deliver business information, but a Turbo service for web users offers full interactivity. You link by a standard line to your service provider and return data is diverted via satellite. A dish and PC Card costs £1,100 (plus VAT). Subscriptions are £13 a month for up to 30Mb, plus 95p per extra 1Mb; or £52 for up to 130Mb, plus 85p per extra 1Mb.

Brian Milnes, MD of distributor Satellite Digital Systems, said "The more people who use the system, the cheaper it can get."

En offers a cheaper PC Card to receive web pages and new forms of edutainment sent via a dedicated TV signal. UK agent, Martyn Rose, says broadcasts could start next year.

SDS 01494 455460; En 01823 665100 www.entechnology.com

Java chips with everything

Chips hardwired to run Java will be available as early as next year, according to Sun. It claims they will run Java code much faster than general-purpose processors like the Pentium.

Java chips could turn devices such as smart phones and PDAs into powerful web boxes. They exist at the moment only as core designs which other manufacturers will implement in silicon, adding memory and input and output facilities to suit their target applications. More details are at www.sun.com

PC giants fight NC tidal wave

Giants of the PC world fought back against a tide of interest in the network computer in the weeks leading up to Fall Comdex, the major industry event of the year.

The tower version of Sun's new network computer

Sun and Oracle (with Britain's Acorn) both unveiled NC models amid much razamataz. The Sun model starts at a stiff £695 (plus VAT) with no monitor, but is said to cut costs by 65 percent.

Claims like this have forced the Wintel axis to answer awkward ease-of-use and cost issues.

Microsoft and Intel even came up with a design for a PC-NC hybrid *(see p44)* and IBM announced a cost of ownership initiative.

The NC wave gathered pace at Comdex, where various vendors including Wyse *(see p35)* showed models. Lotus announced that it will release a Java version of its component software, which will give NCs applets for tasks like word processing.

Corel has posted a beta of Java versions of its WordPerfect Suite at www.corel.com.

Some 10,000 new products were launched at Comdex — *see pages 36 and 43*.

GROVE OUTLOOK: Web livecast of Intel chief, Andy Grove, giving his Comdex keynote in which he predicted that in 15 years processors with a billion transistors, running at 10,000MHz, will perform 100,000 million operations per second compared with the 400MIPS of a 200MHz Pentium

GRAPHIC DESCRIPTION: A sequence from a £29.29 CD of animations called Animation Movie Collection. The idea is that you email them instead of greetings cards. Birthdays will never be the same again. MultiMedia Factory: Freephone 0500 011722

Web gets down to business

A new form of trading institution could bring web commerce to small business and home users. BT, UUNet Pipex and AT&T have all signed up to be Commerce Service Providers (CSPs), taking care of electronic transactions on behalf of businesses.

They use software from Open Market (OM) which can transform a web site from an advertisement into a fully-fledged online business in a matter of hours, says UK managing director, Peter Stanley.

It supports credit card and other transactions up to a minimum of £5. Smaller ones can be charged on account. OM has signed a deal with Cybercash which should allow micro-transactions by next year.

OM has formed a partnership with Logica, one of Britain's largest enterprise system builders, to sell the system throughout Europe and Asia. Customers are likely to include banks and other institutions that risk being sidelined. BT and Pipex both offer CSP services through their web page business arms; respectively BT WebWorld and The Bureau.

Microsoft has launched merchant-server software to allow businesses to take care of transactions themselves.

www.openmarket.com; www.bureau.pipex.com; www.btweb world.com;www.microsoft.com

Forget PCs and NCs: the big money will be made on specialist devices like this prototype map reader from Diba (www.diba.com) which showed a number of similar appliances at Comdex. Watch out for more on them next year.

Robot Cupid unites web lonely hearts

A robot Cupid is helping to bring lovers together, across the world. It's an intelligent software agent that searches the One & Only online dating database of over 15,000 and emails users a list of compatible people. Single people can place a personal ad free, and special categories include nationality (including British) as well as people with disabilities.

One and Only: www.one-and-only.com

"He said he looked like Keanu Reeves… I said I looked like Madonna. The robot had us matched as a perfect pair of liars."

Short Stories

■ Er… we hope you don't mind us mentioning this, as it is the season of festive overdose, but if you or your children wish to contact Mr Claus, you can do so via www.christmas.com where you can see this picture of his latest sleigh. Werth, a seller of Christmas trees, has Santa pages in English at www.German-Christmas-Tree.de

Win a Nokia 9000

■ You can win a Nokia 9000 communicator at Online Information 96, the world's largest electronic publishing exhibition, which runs from the 3-5th December at Olympia, London. Just take your business card to the Quza stand (560) in the Net City section. Quza is a joint Racal-Integralis venture to provide managed internet solutions.

Demon wires users for sound

■ Demon Internet is offering two Real Audio streams to its £10-a-month customers, enabling them to add sound to home pages for which they get 5Mb of space, free. The new facility allows two people to listen simultaneously.

Demon 0181 371 1234

Danmere

■ A price is omitted for the Danmere Backer advertised on page 319. It is £39.95 (incl. VAT).

p31 ➢

New PCs get higher class of Windows 95

The Windows 95 shipping with many PCs is not the one that was launched last year, nor the one you buy off the shelf. Called the OEM Service Release 2 (OSR2), it has so many bug fixes and new features that under the old Win 3.x naming system it would have got its own "x" number: Win95.x does not have quite the same ring.

New features include IDE bus mastering, drivers for CD jukeboxes and optical drives, plus support for CD file system enhancements and Intel's new MMX extensions *(see page 34)*.

A big change is the FAT 32 file system, which handles disk partitions up to 8Gb in 4Kb blocks, called clusters; the old 16-bit system can use a 32Kb cluster for a two-byte file and requires fiddles to address big disks. PC makers have got the features early because the software needs to be tested only for their specific hardware.

Partition Magic 3, which can change disk partitions on-the-fly, supports FAT32 and NT's NTFS file systems
Software Warehouse
01675 466467

Anne Mitchard, desktop-systems marketing manager, explained: "It can take months to test for all possible devices all over the world."

Many of the Windows 95 enhancements are available free for download. To obtain any of the following, just add the filename indicated to the URL www.microsoft.com/windows/software/ in your browser address box:
Kernel 32 Update Stops a browser hogging memory on prolonged use. Not for non-English versions. krnlupd.htm
Kernel Toys Useful tools include keyboard mapper and memory monitor. krnltoy.htm
Exchange Update Replaces the Inbox. Better performance is claimed but there are reports of problems with faxes. exupd.htm
IRDA drivers Infra-red support. irda.htm
ISDN accelerator Support for ISDN expansion cards. isdn.htm
Backup Update Performance boost to the backup applet. backupd.htm
Powertoys Applets for customising the user interface and taskbar. powertoy.htm

NT 5.0 secrets actively revealed

Microsoft last month gave glimpses of what is to come in the next version of Windows NT, codenamed Cairo, only weeks after the release of the latest NT 4.0.

Developers at a Microsoft conference in Los Angeles were given 16 CDs with key NT 5.0 technologies, including a kit for "clustering" NT machines to boost power. Chairman, Bill Gates, promised improved support for multiprocessors. The emphasis on scalability is aimed at boosting NT's share of enterprise-size systems where Unix reigns.

A feature called Active Directory will be able to support more than ten million items per store to enable the expansion of NT installations. It supports a number of file systems (NT Server 3.x and 4.x, NetWare directory services and 3.x binderies, HTTP and DNS Internet services, LDAP repository and X.500) to help machines with different operating systems work together.

Active Server covers a variety of sins including messaging, database transaction facilities and Active Server Pages (previously called Denali), which is included in the new Internet Information Server 3.0 software.

ASP adjusts Web pages on-the-fly to suit the browser accessing them and supports a number of scripting languages. Some of the new features will also be in Windows 97.

■ More details in *News Analysis* on page 44.

Comdex STOP PRESS

■ C++ developers were salivating over Borland's new C++ Builder, which uses the highly-popular Delphi development environment. The product will ship early next year.

■ The Universal Serial Bus (USB), the biggest external change to the PC since the 3.5in disk drive, appeared in force for the first time. It provides a 10Mbit/sec serial connection, plus 5v power, for up to 127 peripherals daisy-chained from hubs, and is expected eventually to replace both the serial and parallel ports.

The USB Implementers' Forum showed products from some of the 200 companies now developing USB.

Devices on show include a gamepad from Alps, the Scan-Man Color 2000 scanner from Logitech, monitors from Philips, a telephone from Intel and an ISDN adaptor from Inforvent.

Hubs and controllers came from Intel, Future Technology Devices, Texas Instruments, Philips, Multivideo Labs and National Semiconductor.

Faster connections, particularly for video, will use new Firewire (aka 1394) ports. ACC Microelectronics showed a 64-bit PCI controller; Adaptec also offers a PCI solution.
USBIF (503) 264-0509;
ACC (408) 980-0622

■ Panasonic showed a phone, using Diba technology (*see page 29*), that receives email and browses WWW text. A keyboard connects to the rear.

Integrated Technology released CompuNet 2000, a PC keyboard telephone with internet capabilities.
Panasonic (201) 348-9090;
Integrated Technology
(201) 907-0200

■ @loha, from Media Synergy, lets email users add animation and sound to ordinary plain-text messages. Recipients need only a Windows email package for viewing.
Media Synergy (416) 369-1100

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Short Stories

■ This wireless keyboard, with a touchpad, was one of several shown at Comdex by Keytronic, which makes the Win95 keyboard for Microsoft. It also showed a keyboard using the new USB serial bus. Keytronic, which has sold largely to PC manufacturers, is now selling via shops and dealers.
Keytronic 353 42 38100 (Eire)

Fractally-compressed video for the web

■ Iterated Systems (IS) has released a video version of its fractal compression product which, it claims, allows passable video transmission even on a 28.8K modem link.

IS claims its ClearVideo system can improve on MPEG by up to 25:1, depending on the image. Compression times of around three seconds a frame are too slow for real-time video but are expected to drop. Clear Video costs £695 (plus VAT). The viewer is free, from:
www.iterated.com
Iterated Systems 01734 880261

Confusion as Intel ships MMX

Intel unveiled the first of its multimedia-enhanced MMX chips last month amid confusion over the future of its Pentium Pro processors. The 166MHz and 220MHz Pentium MMX chips are available now at $447 and $550 respectively.

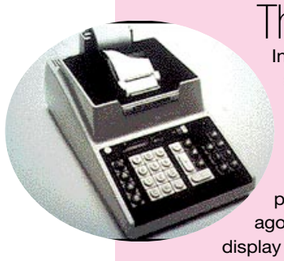
MMX chips support 57 new instructions aimed at speeding up the processing of multimedia datastreams. Pentium Pro chips are to get MMX technology in a version codenamed Klamath, due to launch in February. Klamath also improves Pro performance when running 16-bit code — the current 32-bit-optimised generation actually runs them slower than Pentiums.

Klamath will eventually replace the Pentium Pro, according to a leaked document, *writes Mike McGee of VNU Newswire*. But you won't be able to upgrade from Pentium Pro to Klamath because the new design uses a processor card with an incompatible pinout.

Some industry experts fear confusion over processor options, particularly in choosing between the 200MHz Pentium Pro and the 200MHz Klamath. "There won't be that much difference in performance," claimed Lynley Gwennap, editor-in-chief of *The Microprocessor Report* "and to make matters worse, you'll have the P55C [former name of Pentium MMX] there, barking at the old Pentium Pro's speeds."

But an Intel spokeswoman said: "You can bet your life that we'll position these chips clearly. There will be no confusion."
Intel 01793 403000

The start of it all



Intel engineer Ted Hoff, assigned to build circuits for this 1969-design Busicom calculator, came up with what became the 4004, the first general-purpose microprocessor, launched 25 years ago. Intel celebrated with a web display (www.intel.com) and the calculator featured in an anniversary history exhibition at Comdex in Las Vegas.

Compact Windows gets a GEM of a rival

The new compact CE version of Windows faces a rival from the past: the GEM environment which gave the original Amstrad PC a GUI, and room to spare for applications, in a total of just 512Kb RAM.

The source code of GEM, also familiar to Atari users, is about to be placed in the public domain on the web. GEM, originally less than 200Kb, was developed in the mid-1980s by Lee Lorenzen, who joined Digital Research Inc (DRI) from the famous Xerox PARC lab where the GUI was invented.

An intellectual property dispute arose because a DRI employee had signed a non-disclosure agreement with Apple, with the result that DRI had to make GEM less like Apple's GUI. Ownership passed to Novell in 1991 when DRI found itself unable to compete with Microsoft's OEM licensing practices, subsequently partially curtailed by a US Justice Department antitrust action.

Caldera, founded in 1994 by former Novell CEO, Ray Noorda, bought GEM, with the DR DOS operating system and associated technologies in July. Caldera is now suing Microsoft for "anti-competitive actions" against DR DOS.

Caldera was surprised at the continuing interest in GEM, so it decided to open access to the source code. Apart from device drivers in assembler, GEM is written in C and a 32-bit version is a possibility.

Caldera will also make the source code of DR DOS available and this is expected shortly after GEM. DR DOS will now be called OpenDOS. So far, Caldera has focused on adding value to its Linux CD distribution and developing OpenDOS for special markets — an OEM version is already available.

Further development of OpenDOS, and any commercialisation of GEM, will be from a new UK office, where key members of the original Hungerford-based DR DOS development team work.

Caldera has some ideas for its use in special markets such as touch-screen terminals, PDAs or computer phones. Another possibility is to link a ROM-based OpenDOS GEM, Java and a simple DOS browser in a low-cost network computer.

Graham Lea

Caldera www.caldera.com

NTriguing Java client puts Windows on the NC world

NTRIGUE

A new Java applet will allow Network Computers based on all manner of hardware to run Windows applications. The trick using Ntrigue, a special version of NT 3.51, is already used with Mac and Unix boxes

It works much like PC remote control software. The application actually runs on the server or host, with the guest or client sending key-presses and receiving screen draws. The resulting network traffic is so light that the system can be run over a phone line. Across a local network, an application may even run faster than on a local PC.

Ntrigue comes from the UK emulation specialist Insignia Solutions, which has access to Microsoft source code. The new Java client will allow firms switching to NCs to continue using existing applications.

Another application could be on the web. NTrigue allows site designers to port Windows applications straight to the web. For instance, a Windows-based form linked to a database can be downloaded and run just as if it were a Java applet, though the user would need to have, or be prepared to download, the NTrigue Java client.

Clive Akass

Insignia: www.insignia.com; 01494 453300

Virtual home

Business hotel rooms can seem unreal as you stagger in, culture-shocked and jet-lagged, with your body screaming 5am and time for bed when the clock says 3pm. At London's Royal Garden hotel you can abandon all reality for the virtual world. Not only do the rooms have web access, but you get to put on a VR helmet — at least it may keep a few stressed-out travellers from being ripped off in the sin bins of Soho.

Short Stories

Wyse moves in with three-tier NC range

■ Wyse Technology has a three-tier suite of network computers aimed at corporate users, schools, the health service and government. Its range now consists of the existing Winterm 2000 series, a new high-end Winterm 4000 client, and low-end text-only intranet boxes. The Winterm 2600 is an LCD monitor and can be used as a touch-screen panel with embedded applications. The Winterm 4000s are optimised for Java.

Due to ship next year is a portable wireless Windows terminal, the Winterm 2900, with a touch-screen and a wireless modem.
Wyse 01734 342200

50Gb tape drive

■ Sony has launched SDX, a range of tape drives and media based on Advanced Intelligent Tape technology which stores 25Gb (50Gb with compression) and gives a transfer rate of 3Mb/sec.
Sony 01932 816641

TV switch-off

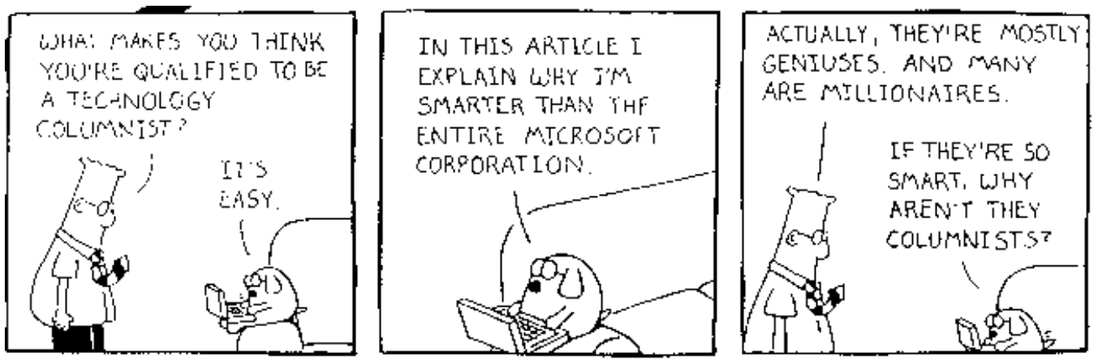
■ PCs are reducing the amount of time that Americans spend watching TV. The drift is particularly marked among the most well off, which could affect advertising revenues, according to a Forrester report.

The first Web-made celebrity?

Dilbert, the socially-challenged engineer, was one of the first international celebrities to emerge via the web.

He first appeared in the US press in 1989 but his fame quickly spread abroad after he hit the web in April, 1993. The humour probably struck a chord with early, predominantly technical, users because author Scott Adams comes from their world: he started drawing Dilbert to relieve the tedium of meetings while working for the Pacific Bell company.

A new book, *The Dilbert Zone*, has just been published and his web site gets 1.6 million hits a day. You can try it at
www.unitedmedia.com



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Short Stories

■ Ericsson claims its new Mobile Office offers everything needed to link a laptop PC or PDA to an Ericsson mobile phone to send and receive faxes, email, short messaging services, browse the web, access LANs or WANs and transfer files, over standard or GSM phones. The Mobile Office supports a maximum data transmission rate of 76.8Kb/sec and will be priced at around £399 (plus VAT).
Ericsson 01444 234567

Flowcharter goes with the Basic flow

■ Flowcharter 7 from Micrografx features "Living Flowcharts", which allows developers to apply Visual Basic code to shapes, making them suitable for interactive questionnaires. Flowcharter 7 includes support for ActiveX. URLs can be embedded in shapes.

Micrografx has also launched Small Business Graphics and Print Studio, which includes Windows Draw 5, Picture Publisher and Instant 3D, a package for creating 3D text and graphics. It costs £79 (plus VAT).
Micrografx 01483 747526

Local Alta Vista

■ Digital has launched a piece of software based on Alta Vista's search engine, called Alta Vista Search My Computer. The idea is that internet and intranet users can integrate PC and web search facilities. The £20 software can be downloaded from the company's site at
www.digital.com

Oh Brother!

■ The new Brother Professor MultiMedia Powerhouse PC has been launched, with a Pentium Pro 200 processor, an Intel 440FX chipset, 32Mb EDO RAM, 256Kb pipeline burst cache and a 2Gb hard drive.
Brother 01279 416888

Sharp puts digital camera in new colour palmtop

Sharp showed off its new, colour Zaurus palmtop, the MI-10, at Comdex. The device is currently available only in Japan and may not be sold in Britain (where the Zauruses are called the ZR range, because of a trademark clash).

The Zaurus (*pictured, right*) in Japan has a 5in, 65,000-colour screen and one model, the Mi-10DC, comes with a PC card-based digital camera.

It has a 32-bit RISC processor, an infra-red port, built-in web connection and browser software, and can send and

receive faxes. Email comes with a "multimedia mail" facility which allows you to attach still image or audio files to mail messages. A built-in voice memo function allows voice messages to be stored as sound files, or forwarded.

Sharp also launched the first wide-screen portable. The PC-W100T has a 16in x 9in screen with 1024 x 600 resolution. It has a 133MHz Pentium processor, 16Mb RAM and a 1.1Gb hard disk, and costs a recommended £2,995 (plus VAT). Watch out for a review in our next issue.

Jessica Hodgson

Sharp 0161 204 2633

Toshiba cuts prices as rivals snap at its high-end heels

The Dolch L-PAC lacks card slots but costs less than its stable-mates

Toshiba has introduced seven new notebooks across its range and cut prices of existing models by up to 27 percent, as rival notebook makers vie for a slice of the high-end corporate market.

The four Satellites, one Portege and two

new Tectra models, all boast 800 x 600 screens, optional CD drives and Zoomed Video for fast graphics. The new Portege 660CDT takes a new, slimline, ten-speed CD drive.

Dell has launched its most powerful Latitude yet. The XPi CD P150 has a 150MHz Pentium processor, 16Mb of RAM, a 12.1in SVGA TFT display, six-speed CD and a 1Gb disk.

Samsung has introduced a new range of Pentium-based multimedia notebooks, the Sens Pro500, priced from £1,595 to £2,999 (plus VAT). The entry-level N500 model has a 100MHz Pentium processor, 8Mb EDO RAM, 810Mb hard disk and 11.3in SVGA DSTN display.
Toshiba 01937 828828; Dell 01344 720000;
Samsung 0181 391 0168;
Dolch 01928 263622

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Short Stories

Pure Virgin sound with RealAudio 3.0

■ A beta version of RealAudio 3.0, which offers stereo sound over a standard internet link, can be downloaded from Virgin Radio's site at www.virginradio.co.uk/radio.html

Virgin broadcasts live over the net in RA 3.0 stereo, so you can try it out while you are at the site. Further details are at www.realaudio.com

The new Virgin Net is offering a free personalised news service called Autonomy to tempt new subscribers. It delivers daily news on your specified areas of interest. The Autonomy software is also available separately for £49.99 (incl VAT) from major outlets, or CD Revolution on 01932 562000.

Insurance job

■ Total Computer Cover, backed by Sun Alliance, is offering what it claims to be unique insurance cover for computers for homes or businesses. Users can claim for fire and other damage as well as theft, and TBC says claims will be settled quickly to minimise down times.

TBC 01625 526777

Family way

■ Epson is giving away a kit for printing up to ten T-shirt designs with every Stylus Color 500 inkjet printer sold. The recommended price has been cut from £274 to £257.

Epson 01442 611144

History of games

■ An exhibition on the history of video games runs at London's Museum of the Moving Image until next May 15th.

MOMI 0171 815 1331

Cheap ISDN card

■ Solwise is offering a 128Kb ISDN card, with an analogue port for a standard phone, for £149 (plus VAT). The card fits a standard PC ISA slot and comes with Win3.x/95 drivers.

Solwise 01482 473899

Free storage offer as off-site backup goes mainstream

Remote storage, long used by big companies to back up vital data in case local files are damaged or stolen, is about to go mainstream, according to the directors of a new low-cost web-based service.

Camberley-based Netstore, in partnership with the US company Connected Systems, is offering up to 100Mb of off-site data storage free as a way of turning people on to the idea.

The offer is open even to home users who do not plan to take up the paid-for service. They can expand their storage only at the rate of 5Mb a month up to the maximum.

"We believe that small businesses will need more than that," said Netstore managing director, Jeff Maynard. Charges for greater volume depend on the amount of data backed up, the number of workstations, and the frequency of backup.

The standard service costs £3 a month for up to five workstations, adding up to 15Mb a month to an unlimited total. Full details are at www.netstore.co.uk. Netstore automates regular backups in such a way that only changes to files are transmitted.

Clients can use a standard web connection to access their data, which is encrypted to ensure confidentiality. A bonus is that the data, stored physically in highly-secure US servers, can be accessed from anywhere.

Netstore 07000 638786

World creator

The PC's new 3D graphics capabilities, once the teething problems are sorted out *(see News Analysis, page 46)*, will be useless until games and applications are written for them. 3D authoring has tended to be done on expensive workstations, but MultiGen is shipping the latest version of its flagship, GameGen, in versions for Windows NT on the PC, as well as its traditional Silicon Graphics platform. GameGen II allows you to create 3D worlds, and either create or import "assets" and characters to go in them. The standard format can then be used for 32-bit or 64-bit games on platforms as diverse as Macs, PCs, the Nintendo 64, the Sega Saturn and the Sony Playstation. Product manager Rick Bess said GameGen II will allow small software houses to get into 3D game development. It costs £6,995 per user.

Transformation Software 01844 261456

Compaq follows the Sun

Compaq has launched a high-end workstation range in a bid to grab marketshare from Sun and Unix. Compaq's Workstation 5000 range is targeted primarily at the finance and CAD markets. Hugh Jenkins, enterprise product manager, Compaq UK, said: "Compaq professional workstations priced at £3,000 performed better than a £20,000 Sun. We are challenging the Unix/RISC markets with products that deliver far better price/performance." Dataquest predicts a massive takeup of NT/Intel workstations.

Compaq 5000 workstations will come with one or two 200MHz Pentium Pros, wide-ultra SCSI controller, up to 512Mb of ECC DIMM memory, an eight-speed CD-ROM drive, and 10/100Mb/sec Ethernet.

Compaq 0990 134456

● *Sun fights back — page 41.*

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Sun puts a Sparc board into PC boxes

Sun is the latest high-end workstation vendor to come up with a low-cost desktop option, as increasing Pentium Pro power enables PCs to threaten the high-price, high-performance market.

Sun has taken a different approach to Silicon Graphics and its £5,000 O2 graphics station. It is offering a motherboard, based on its UltraSparc chip and Solaris operating system, which has the same dimensions as a PC ATX board so it will fit into a cheap PC system box. It will operate on a standard PC power supply (heavily smoothed by two daughterboards), off-the-shelf memory chips and PCI cards. Processor options range from the entry-level 167MHz UltraSparc-I to the 250MHz UltraSparc-II.

Sun claims all these outperform the 166MHz PowerPC 604e and 620e, and the 200MHz Pentium Pro, particularly on floating-point operations.

Product manager Peter Palm said PC system builders will be able to make Ultra-Sparc stations for as low as $4,000. Applications are expected to include web and Java servers.

Sun 01276 204444

Smart searcher Muscat rambles to the tune of Java

FEN WATCH
CAROLINE SWIFT, business editor of the *Cambridge Evening News*, continues her reports from Silicon Fen

CAMBRIDGE is the breeding ground for some smart little software creatures that are getting themselves Java enabled. Muscat, a small Cambridge firm, is being tracked down by the great and the good for developing intelligent search engines that nose out any clues thrown their way.

Such talents have not gone unnoticed. In the House of Commons, a Muscat engine is indexing and searching for Hansard archives. Over the past year, Muscat has been busy developing the search engine and software for Reuters News Explorer, launched this month at Olympia Online.

Last month, Muscat was at the launch of the Java workstation in New York and in Brussels — the I-Station, using a Java front-end to Muscat. The server system was written by Muscat customer, Cascade Systems. At the demo stage, John Snyder, one of Muscat's founders, said: "We are putting Muscat into Java so programs can be written and deployed on any system including Mac. We will build Java front-ends to an engine inside Netscape, to make it more interactive."

Any Java-enabled browser can be used. "When someone comes to our search engine they download a Java applet which gives them a three-dimensional screen which is interactive."

Muscat gets emailed love letters — "We love your ferret". The company is moving Euroferret back up to Cambridge from London in order to put more resources into it. Traffic has increased and the plan is to be able to index one million people a day.

The search engine crawls around the web and indexes only European pages. For the football fan it means not being caught with irrelevant American football pages. Its technology has been selling to those needing a closer focus — wanting to index their own part of the web — and has been taken up by organisations such as Business Link.

Virgin is the biggest corporate customer of the Muscat multi-site indexes, using its Euroferret technology on the newly-launched Virgin Net service. It has indexed all 5,000 sites of interest to the Virgin user.

Java is calling the tune now, says John Snyder. "There is a general awareness of Java and how it is going to change things. It is making the browser front-end much more interactive as part of the search process.

"Putting all Muscat software into Java makes it independent for deployment by other software companies who want to use Muscat in their own applications."

Java Muscat software, launched early this month, can be sampled on Muscat's site at www.muscat.co.uk under Muscat.fx. freeware. The freeware can be used to index HTML pages.

■ A Cambridge company was launched last month on £1 million funding from a group of private investors to enable secure electronic transactions using strong cryptography.

Investors in the startup, called nChipher, include Terence Matthews, chairman of the billion dollar Canadian networking and telecoms company, Newbridge Networks.

Technical director Dr Nicko van Someren and chief scientist Ian Harvey graduated with firsts in computer science from Trinity College. The firm is on the fast track to developing products that simplify the use of cryptography in applications such as internet security and electronic commerce. Believed to be ahead of the field, they are claiming to be able to speed up the authentification process 100-fold using a bolt-on product. The first product, Fastness, is due out in the spring.

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Apple gets mobile in schools

Apple has launched a stylish machine called the eMate for schools. It's notebook-sized, weighs 4lb, and runs the Newton palmtop OS. Basic applications are built in, with an emphasis on education features such as graphing. It uses a 25MHz ARM 710a processor, 3Mb of RAM, and has a PC Card slot. Apple and Acorn have a joint company called Xemplar to sell into UK schools. A Xemplar spokesman said the eMate, priced at about $800, will not appear here until next year and will not compete with Acorn's Pocketbook, a rebadged Psion customised for schools. "The eMate costs more and is better suited to heavy-duty input, he said."

Apple has also launched a new Newton mobile.The MessagePad 2000 uses a high-performance 160MHz StrongArm chip (developed by Acorn stablemate, ARM). Apple 0800 639866

Apple Chirpy about MacOS for the PowerPC platform

The AIM consortium (Apple, IBM and Motorola) took a tent at Comdex to show off machines from themselves and other vendors based on the PowerPC Platform spec, which is designed to offer the best of the PC and Mac platforms.

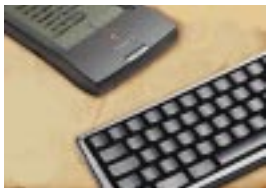
The spec is still referred to as Chirp, from the acronym of its original title, the Common Hardware Reference Platform. The idea was to encourage third-party developers to build machines around PowerPC chips that could run either the MacOS or Windows NT. Crucially, they could also use standard PC peripherals, including PCI cards, so that they can take advantage of the economies of scale of the PC market.

Third-party MacOS machines have already appeared from the likes of Umax and Power Computing. But the turning point should come next spring when the MacOS for the PowerPC ships, bringing optimised software and tightly-specified Chirp hardware together for the first time.

Chirp boards and even chipsets will come from specialist developers and manufacturers, as in the PC clone market, according to Ross Ely, Apple's PowerMac product line manager. This will free Apple engineers from support and mainline development to concentrate on "the 3D graphics, the i/o ... the differentiators for the PowerPC platform."

MacOS for the PowerPC is based on System 7.6, the mini-upgrade of the Mac OS which is expected to ship in January.

Clive Akass



Key to portability

One of the best accessories for the MessagePad is this keyboard, weighing practically nothing but being big enough to type on. Apple is to market a wallet next year which takes both, effectively giving the MessagePad the usability of a notebook.

New Winzip

The new version 6.2 of Winzip includes support for Uuencode, Xxencode, BinHex, and Mime3. It also supports self-extracting files. A disk containing both 16-bit Win3.1 and 32-bit Win 95 versions can be ordered for $29.95 from www.winzip.com

Top 10 Windows software

			Last month
1	SoftNET Internet Pack	Software W'house	-
2	Windows 3.x to Windows 95 U/G	Microsoft	1
3	Microsoft Encarta 97	Microsoft	-
4	First Aid Deluxe	Rod Manhattan	5
5	Norton Anti-Virus 95	Symantec	-
6	Partition Magic	POW Distribution	9
7	Microsoft Flight Simulator 95	Microsoft	-
8	Microsoft Publisher v3	IMSI	-
9	McAfee Virus Scan 3 in 1	Mcafee	10
10	WinDelete v3	IMSI	-

Top 10 CD-ROMs

1	Inside Independence Day	Electronic Arts	-
2	Encarta 97	Microsoft	-
3	Encarta 97 World Atlas	Microsoft	-
4	The Unexplained	Flagtower	5
5	Cinemania	Microsoft	2
6	Organic Art	Warner Interactive	4
7	Autoroute Express UK 97	Microsoft	-
8	Autoroute Express Europe 97	Microsoft	-
9	Astrologer	Maris	8
10	Music Central 97	Microsoft	-

Top 10 DOS software

1	System Commander	POW Distribution	1
2	Ski Europe	Pearson	-
3	MSDOS v6.22 U/G	Microsoft	4
4	Turbo C++v3	Borland	6
5	Formula 1 Grand Prix	Pinnacle	5
6	Turbo Pascal v7	Borland	-
7	Quake Full Release	GT Interactive	-
8	Tas Books	Megatech	-
9	The Last Dynasty	Sierra	-
10	Flightshop	Appollo	-

Top 10 peripherals

1	Primax 4,800 Flatbed Scanner	Primax	-
2	Sicos DMS2000 & Textbridge OCR	Sicos & Xerox	-
3	Mirai 8x CD-ROM	Mirai	-
4	Epson Stylus Colour 500	Epson	6
5	Philips 28.8 fax/modem (external)	Philips	-
6	miroConnect 34 Office	miro	-
7	USR 33,600 voice fax/modem	US Robotics	8
8	8x CD-ROM & 32-bit sound card	Aztech	-
9	10x CD-ROM & 32-bit sound card	Aztech	-
10	Evergreen 486 to 586	Evergreen	-

Software and peripherals figures supplied by Software Warehouse. CD figures courtesy of HMV Games/Level One

Fat chance for thin clients

Nearly everyone made NC announcements in the run-up to Comdex last month. Clive Akass reports from the Microsoft Developers' Conference.

Life in the US imitates television, especially in the computer industry. The protagonists in the network computer (NC) debate are all straight out of a soap opera: Sun chief Scott McNealy talks in soundbytes and looks as if at any moment he will break into a song and dance act; Oracle's Larry Ellison appears as a megalomaniac, convinced he is about to take over the world. And Bill Gates, who really *has* taken over the world, if only temporarily, conducts his public business like a TV show host, complete with celebrity appearances and special effects. The special effect at this conference was to fly British journalists 8,000 miles to LA and then address them via satellite video-link from his hotel room in London.

Gates has reacted to the NC like a heavyweight champ caught by an unexpectedly severe punch: confident of supremacy, yet rattled enough to look to his guard. The ostensible reason for the international press gathering was to show off work on the next version of Windows NT only weeks after the launch of version 4.0 (see *Newsprint*).

Microsoft has been forced to react to the ubiquitous NC. This one, from Wyse, is installed in a UK school

But woven into the proceedings were arguments for the fat client, the feature-laden PC, as opposed to the thin client or NC, the machine that is little more than a window onto the network. Most of the arguments have been chewed over, *ad nauseam,* for the past year. Major among them is the claim that even large companies don't have data pipes big enough to support thin clients, and certainly not enough to sustain the kind of multimedia-rich environment offered by PCs.

Applications group vice-president Paul Maritz boasts that the internal architecture of Windows is being "completely replumbed" in a rolling program of incremental changes to provide high-performance 3D graphics (*see page 46 for a rather less happy perspective*). At the same time, Microsoft implicitly recognised the force of the arguments in favour of the NC, with what it described as two major announcements:

1. The Zero Maintenance Initiative (note the word "initiative"; this is technology still in the making). The main idea is for the central server to hold a registry of all applications and files on its clients, enabling global maintenance from a single machine.

2. The NetPC, which will be made by various vendors to a reference design from Microsoft and Intel. It's a thinnish client, essentially a PC without expansion slots, and using local disk as a cache to relieve network traffic rather than for permanent storage. Gates described this as combining the best of the NC and the PC.

Microsoft also stressed initiatives to make the PC easier to use. The successor to Windows 95, codenamed Memphis, will support automatic system updates via the web. Both it and NT 5.0 will use the Windows Driver Model, allowing the same hardware drivers to be used with either operating system, and OnNow, a standby mode which "wakes up" the PC to take a data or fax call.

NT 5.0 Server will have a new set of tools for managing distributed computers. Most interesting for the desktop user is the server which will store a client's switch-off state: this lets you log straight in to where you left off, even from someone else's machine. Microsoft showed some of this working on top of NT 4.0 code and it was impressive. The company did not get to the top on hype alone, and it is not about to be toppled by hype.

Nevertheless, the computing world is changing in ways beyond even Microsoft's control. I asked Jim Allchin, senior vice-president of Microsoft's desktop and PC division, about the extent to which the company's strategy, particularly its ActiveX component technology, chimed with the all-aboard universality of the web. He insisted that ActiveX was universal, that it was running on Mac and Unix boxes. "We also have NT running on a number of platforms, including RISC," he said. But he admitted that ActiveX will not run on all the new computing devices, like set-top boxes and smart-phones, that will soon hit the market. It will not even run on Windows CE (see *Beyond the desktop,* opposite).

I suggested that here was one aspect of the NC that Microsoft could not counter: the simple elegance of the idea of a virtual machine that can ride the web on any hardware it likes as long as it speaks HTML and runs Java. I was also rash enough to mention Sun's Java chip *(see Newsprint)*. Allchin resorted to what Microsofties have been doing all year: trying to destroy the NC message by shooting the NC messengers. "That chip is just Scot McNealy's way of trying to lock people into Java, into Sun's technology. We know that well. We talk to his people all the time and they tell us," he said with some acerbity. Perish the thought that Microsoft might try something like that. ■

Beyond the desktop

The new CE operating system in the latest handhelds brings take-away data to town. Tim Bajarin considers whether this could be another winner for Microsoft.

One of the most important announcements at Comdex was the introduction of handhelds using Microsoft's new Windows CE operating system. Microsoft will not say what CE stands for: many think "consumer electronics" but it was initially referred to within the company as Windows Compact Edition.

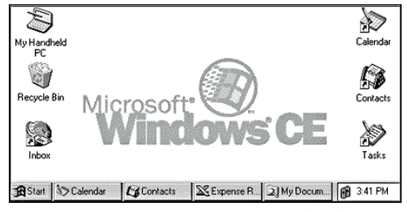
CE was designed to help Bill Gates extend his Windows franchise beyond the desktop as the information appliance market develops over the next few years. Its first incarnation may be on the handheld PC, but it can be used on set-top boxes, Web TVs, smart-phones and any other information appliance.

At first, it will support the Hitachi SH3 and MIPS 4000 RISC processors but can be tuned to support Intel chips, too. Microsoft focused on the Hitachi MIPS 4000 chips because they offer high power at very low cost.

The first reference design is a handheld PC which connects to the desktop and enables users to take desktop data with them on the move. A synchronisation program instantly reconciles data in desktop and handheld files. This automatic procedure should be compelling to anyone who uses a Windows 95 desktop. The other key design feature was to replicate the actual Windows 95 interface, eliminating the learning curve for Windows users.

CE uses the same 32-bit kernel as Windows NT but with only 500 of the 4,000-plus API calls. It ships with pocket versions of Word, Excel, Internet Explorer 3.0, a contact manager, and Schedule Plus on ROM. Files are compatible with their Windows equivalents.

Hewlett-Packard, Compaq, NEC, Casio, Philips and LG Electronics have a six-month exclusive deal to be the first onto the market with these Hand PCs. By late spring, at least five other vendors will jump into the market. Only Casio and Compaq were ready to ship on launch day. Compaq's is actually a rebadged Casio; next year, it will be designed in-house. At the time of writing, NEC was due to ship towards the end of November, with LG Electronics and Philips delivering in January and H-P in spring.



The CE interface on one of the new handhelds

Creative Strategies predicts that 350,000 will be sold worldwide in 1997 and 750,000 in 1998. Sales of "consumer" organisers have reached about 350,000 units a month worldwide and market leaders like H-P's 200 LX, the Sharp Zaurus and the Psions have, to date, an installed base of about 500,000.

The first CE machines use existing organiser screens and keyboards, and as a result they are hard to read and type on. I expect second-generation versions to have an improved design and broader market appeal.

It is not clear what impact word-of-mouth and magazine reviews will have on sales. The poor screens and keyboards alone could generate bad reviews. But if CE machines are seen as " take-away data" devices with a Windows look-and-feel, Microsoft could have another winner on its hands. With over 500 developers supporting Windows CE, you can expect to see it become a strong candidate for use in many other devices. ■

NC *vs* PC — the pressure builds

The battle between Microsoft and the network-computer camp is getting serious. Sun and Oracle have both launched NCs (network computers) in the past month, with much hype, and many in their camp actually believe they can de-throne Microsoft in corporate America by the end of the decade as Java applications flood the market.

This may be unrealistic, but my sources say that, for the first time in memory, Microsoft is very concerned. It is not jumping into the NC fray because it wants to. It wishes the NC concept would just go away and allow Windows to become the only operating system for corporate America.

It is being forced to confront the issue by information-system directors who are loath to move to Windows NT because of the cost of upgrading their entire PC line. And the cost, in terms of time and money, of administering these next-generation operating systems is high when compared to the NC, for which almost all upgrading and maintenance can be carried out from a single, central, server. Many PC users, including myself, don't like the idea of relinquishing control of the desktop to a server administrator. But as PCs become more powerful, they become more complicated to use and maintain. I would love one that needed almost no maintenance and worked flawlessly each time I used it.

Hence, Microsoft's talk of its own thin client and "zero administration costs" *(see opposite)*. The Sun-Oracle NC consortium is getting so much attention in the *Fortune 500* companies that Microsoft has to make its thin client easy to use and cost efficient. With even Bill Gates getting into the NC arena, you can expect this to be the hottest topic in our industry well into 1997.

p46 ➢

Premature extrapolation

Urged on by forecasts of a huge increase in the numbers of 3D boards to be shipped next year, an over-excited industry appears to be putting the cart before the horse, suggests Dylan Armbrust.

According to the John Peddie Report *(JPA Quarterly Hardware Market Report*, 15th June, 1996), up to 40 million graphics boards will have been shipped worldwide by the end of 1996, just over two million of which are 3D boards. It predicts that a further 1.25 million 3D boards will be shipped during the first three months of 1997, indicating sales of five million (if you extrapolate) for the whole, in that year. That is an expected increase of 150 percent over the previous year.

These are impressive statistics and we are already seeing 3D beginning to infiltrate the market. Gateway 2000, one of the highest-volume shippers, has incorporated 3D cards or chips into its boxes and could ship upwards of two million units for the coming year. Even smaller PC builders such as Dan and Panrix have shifted towards integrating 3D-capable cards into their machines.

If you ask them why, they'll all say the same thing: they are getting ready for the 3D revolution, especially for games that make use of Direct3D, the new 3D programming interface and part of Microsoft's DirectX multimedia enhancement API.

Last January, I sat through a strategy briefing by Matrox Graphics when representatives talked about the company's Mystique board (top secret at the time) and how they had decided to chase aggressively after the consumer 3D market. "3D graphics acceleration has become one of the most sought-after features in the mainstream computer industry today," they said, and the key to the 3D market was gaming; the largest consumer segment. They projected that by this Christmas 30 percent of all new games titles would be authored under Direct 3D (D3D) — this was pretty optimistic but nothing new, as it has been the industry mantra for the past year.

But the 3D phenomenon can be likened to the emerging cable and satellite TV industry in which there are lots of channels to watch but not enough content to fill them: almost all graphics card manufacturers have a 3D card but there is nothing to play with out there. Only two fully-D3D games; Monster Truck Madness and Hellbender, were available in Britain in October and a handful more were due to have been released at Comdex in November — this is a far cry from that 30 percent prediction, especially in the UK.

There is also the problem of DirectX driver compatibility (*see* our *group test, p210*). At the time of going to press, there was an inconsistency in who had DirectX-capable drivers and which version they were using. Some manufacturers by-passed DirectX 2.0 altogether and decided to implement DirectX 3.0 although, in the case of Hercules, it meant delaying full 3D functionality for the Terminator 3D graphics card.

Lack of content and driver incompatibility does not normally bode well for the industry but all, from games developers to hardware vendors, to Microsoft, put their faith in the future of 3D. David Weeks, Windows product manager, concedes that D3D "is still in its infancy" but says that DirectX has achieved "tremendous gains" in a year. He predicts that up to 30 D3D games will be available early next year. Few appear to disagree with Weeks and the Microsoft message. Even those who at first ignored DirectX 2.0 are not doing the same with DirectX 3.0: they know a good thing when they see it, even in the early days.

The 3D revolution has arrived, but so far only in small quantities: Monster Truck Madness, from Microsoft, is one of the few D3D games available before Christmas

But with ever-evolving standards the consumer can forget any sort of stability in their display drivers in the days ahead. It has been rumoured that Microsoft will be releasing a DirectX 4.0 update in January, with another due to follow in June. Microsoft has stated that it expects only one update in that time, with the betas shipping in March. Who's to say what is really going to happen?

Most hardware vendors claim that they are continually upgrading and honing their drivers, all of which can be downloaded from the web. But this is usually an excuse to rush to market with an incomplete set of drivers so that they can get a market toe-hold and then play "oops, catch-up" via updates on the web. In the end, though, it is the consumer who ends up out in the cold. Pity the majority of PC owners without web access, unable to upgrade their first release and potentially buggy drivers.

With Microsoft's long-term strategy of "re-plumbing" the Windows Multimedia Architecture (see *Newsprint*), you can expect more of the same for the next few years. Let us hope that modem sales increase substantially or that the industry quickly moves from infancy to adulthood. ■

Sounding Off

Why do people coo over super-mega-gobsmacking Pentium laptops with a short battery life? It irritates the hell out of Michael Hewitt.

Michael Hewitt

If you want some idea of what it's like to be dead, you could do worse than come to Mousehole, in Cornwall. After a few minutes trudging its narcolepsy-inducing, near-lifeless streets, you find yourself desperately seeking some Enchanted Princess to kiss in order to wake the whole place up.

Apologies to Mousehole's residents. They'd doubtless tell me that it only *seems* like the arse-end of nowhere and that, in season, Mousehole is Where It's At; that The Ship Inn, in whose sleepy lounge bar I'm currently tapping away on my laptop, is actually the South West's major sink of iniquity from May through to September, with go-go dancers and a strip show every half hour.

But I live here now. Not in Mousehole but in nearby Newlyn. Shortly before I made the move, I decided a thorough clear-out of my computer equipment was in order. The ensuing casualties included my busted Compaq, hurled into a south London skip, and my Librex (remember them?) which I offered to a good cause. Leaving me with just one laptop: a 1989 Psion MC-400.

I can hear it now: "How can you possibly function with such an obsolete, non-standard, underpowered piece of kit?" Well, say what you will, but in the seven years I've owned the thing, I don't believe any manufacturer (except perhaps Amstrad with its NC100 and NC200) has come close to producing anything better in terms of fitness for purpose. Certainly, I'd like to be able run Windows 95 and the same programs as my desktop machine, but I wouldn't want to give up the MC-400's 50-hour battery life, its near-perfect keyboard and its amazing durability.

I've harped on about this before, I know, but as no-one's bothered to act on my bleatings, I'll do an encore. What particularly irritates me is the way people coo over these multimedia, integral CD-ROM Pentium laptops with their supertwist LCD screens and four-grand price tags. Just recently, a *PCW* reviewer brought himself close to climax describing the latest unit. What particularly impressed him was its four-and-a-half hour battery life. Son, that's not a battery life, it's a battery footnote. If it were human, it would be a criminal offence to serve it anything stronger than Kaliber.

Where did things start going so askew? Five years ago, we were edging towards a conventional laptop that would keep going all day. One of the Zeniths, I recall, boasted eight hours' life before handing in its dinner pail. And that was with a standard Nicad battery, too. Nowadays, with Nickel Ion and Zinc Air, we ought to be approaching something that makes it to pensionable age.

But colour happened and suddenly, everyone wants a colour screen. Everyone wants a CD-ROM and speakers, too. Essentially, everyone wants a dwarf version of their desktop machine. The poor battery must feel like that Caliph with his 365 wives. But why does everyone except me want an all-singing, all-dancing laptop? Or is it just the manufacturers forcing it on them?

This morning, I strapped the MC-400 onto the back of my bike and set off down a bumpy country lane. I wouldn't have dared do that with, say, an IBM Thinkpad. Or any laptop (and that's all of them) with precision-engineered moving parts. First stop was a church in a village called Paul. I got off the bike, undid the Psion and turned it on. On it came. No pissing around for two minutes booting up. Then I typed a few memos to myself. At the end of this, I didn't bother saving the file, I just shut down the Psion, knowing that I'd be able to resume where I'd left off. Which I did once I reached Mousehole. I sat down, turned on the laptop, and continued. Then I got the idea for this month's column, and so closed the clamshell case and headed in the direction of The Ship Inn for lubrication. And, well-lubricated, here I am still. And, more importantly, here, still, is the Psion's battery, with a lot more life in it yet. After finishing this column, I could fill in a spreadsheet, populate a database. Anything. For several more hours.

The point is, most people use computers for word processing, spreadsheets and accounts. Psion and others have shown that you can do all these more than adequately on a machine based around a low-powered 8086 chip. Yes, of course there's a need for a fully-specced colour laptop, but I'd reckon it's a niche market.

Right now, it's technically possible to create a rugged, reliable laptop, smaller and more powerful than the MC-400, with a full-size keyboard, high-resolution screen, and the sort of functionality that will keep most computer users perfectly happy. And it will keep on keeping them happy all week from a single set of batteries. Okay, there won't be any snazzy graphics, colour or sound. But if you want that, you'd just point the laptop in the direction of your PC's infra-red port and transfer the data.

So how about it, manufacturers? Eventually, this Psion is going to wear out and I'll need something to replace it. Two years ago I made a similar plea. I hope I won't be doing it again in another two years' time. ■

Homefront

What Tim Nott really needs is a 21in monitor… and a desk extension to cope with it. Never mind, the end is nigh for the CRT. Isn't it? They've been saying so for years, yet it's always jam tomorrow.

Tim Nott

Have I done my keyboard rant? Oh yes, back in July, 1995. But to briefly recap, the QWERTY keyboard layout hasn't seen an upgrade since 1872, when it was designed expressly to slow down typing speeds. So let's turn to that other desktop peripheral, the monitor. Based on another piece of 1870s technology, the cathode ray tube, this, at least, has seen some development, notably the advent of colour in the 1950s.

Three years ago, I decided to upgrade my monitor to something I could gaze at all day without risk to eye and brain. Even though I had the privilege of a discount in return for shamelessly plugging the company for the rest of my career (something I've now stopped doing), I still had to write Eizo a four-figure cheque. And, I risked a hernia carrying the thing up the 44 steps to the room where I work, *and* I had to extend my desk. Now, don't get me wrong. I've never regretted the purchase, and my seventeen inches are much admired by envious visitors. Unlike the rest of my PC, age does not wither it, nor custom stale.

"Me, I'll hang on for another five years until the tube-based monitor is a thing of the past"

As monitors go, it's excellent, with a clear, undistorted and flicker-free display; the trouble is, monitors *don't* go. Not far enough, anyway. To use Windows as nature intended, say, viewing two legible, lifesize A4 pages, or one page of processed words and a reasonable expanse of spreadsheet, you need at least 1,280 x 1,024 pixels. And given the relentless encroachment of button bars on to the screen real estate, 1,600 x 1,200 would allow a margin of future proofing. I can push my monitor to the former resolution but that's stretching it very near the limits of its dot-pitch. It also means increasing the size of fonts, icons and buttons to the point where the exercise is almost self-defeating. So what I really need is a 21in monitor which would entail another, reinforced, desk extension, provide hernias for two and, even though prices have fallen, give my bank manager a fit.

The desk space thing isn't just a joke. It's advisable to place the screen 50-70cm from the eyes if you want to avoid eyestrain, backache or a cricked neck. Which, given the size of these beasts, means a desk measuring about 120cm, front to back. But even if you had the room for it, you'd have trouble finding one. And while we're talking size, another interesting feature of this antiquated technology is that screen sizes are still measured in inches — even in mainland Europe. Not only that, but the quaint custom of quoting the size of the tube rather than that of the display itself still prevails. To paraphrase Disraeli, there are lies, damn lies and statistics such as "Mine's xx inches".

But never mind. "In five years, the tube-based monitor will be a thing of the past. Large-format colour screens that you can hang on a wall or slip into a briefcase will be the norm." So wrote one industry pundit in 1988. And every year since, various experts have paraded with their sandwich boards showing a similar "End is nigh" message for the CRT. Jam tomorrow but never, it seems, jam today.

However, things are looking up. You can now get a 17in PixelVision TFT screen. It's just three inches deep and costs around £7,500 plus VAT. In early 1997, Fujitsu will be marketing a 21in, flat TFT display for around ten grand. Jam today, at last, but at prices that would make Fortnum and Mason blush. Me, I'll hang on for another five years, until "the tube-based monitor is a thing of the past". Then, for around £300 we'll be able to get nifty displays that fold up like a slim magazine, or roll into a tube. Yes, trust me — I'm an industry pundit.

Name that @

Just as this column was stuck for the last 150 words, replies to the search for a name for the @ symbol used in email addresses (Homefront, December) started trickling in. Philip Davies had two suggestions: "com-a" (pronounced "commay"), a shortened version of "commercial at"; and "a-hole", short for "a in a hole". Well, the first isn't much cop as "com" is already in use and "fred com-a bc.com" is too confusing when spoken. The second, although sounding rather too much like "aol", shows promise. As Philip points out, "I think a-hole may be doomed to misunderstandings by the more street-wise." And why not? "Arsehole" is certainly graphic, memorable and unlikely to already form part of a host or domain name.

Sophie Dixon had an even better suggestion. Equally anatomically graphic but suitable for polite company, "belly button" is my favourite so far. ■

Straight Talking

Oftel has decided BT's increased ISDN prices are "worthwhile price cuts" and has withdrawn its threat of legal action. Barry Fox does a double take.

Barry Fox

Oftel has now decided what to do about BT's decision to increase the price of ISDN lines. After threatening BT with legal action, Oftel's director general, Don Cruickshank, says the increases are "worthwhile price cuts".

"All BT has done is move the figures around and introduce complex tariffs," says Bill Mieran, chairman of the Telecommunications Users Association. "ISDN is still too expensive. We thought Oftel wanted to do something about it, but it hasn't."

To briefly recap, the cheapest way so far to sign up for ISDN has been to pay BT £400 (plus VAT) for connection and then pay £336 a year for line rental. In June, Oftel told BT to be more "imaginative" in its marketing and BT came up with the "flexible approach". The rental on existing lines went up by £16 a year and new users faced a bewildering range of options which bundled a "free" call allowance with rental and installation costs.

These have now been re-jigged so the cheapest connection charge is £199 (plus VAT), with free calls worth £105 a year. But, and it's a big "but", users must pay £535 per year rental for a minimum of two years. Another option leaves connection at £400 and increases the rental to £352. This makes it even more important to know whether the investment is worthwhile.

Tel-Me is a good example of a service that uses ISDN efficiently. Tel-Me's software works on the user's PC to check passwords and prepare an information search request offline. Only then does it wing off to the Tel-Me server. The search result comes back and the call is disconnected in far less time than it takes most email services to logon a caller. But this only happens because Tel-Me is offering direct access to its database server.

ISDN does not speed up logon to an email service such as CompuServe or MSN. However, once you are connected, large files upload and download very fast. But they move pretty fast with a 28.8K modem, and how often do you transfer vast files by email? Once you are out into the net, there is seldom any advantage in using ISDN. Real transfer rates seldom exceed 1Kb/sec, or 10Kb/sec at best. So the real working speed is no faster than you get with a 14.4K modem.

Forget the promise of streaming video, in real time. If you have seen this demonstrated, the source is almost certainly a hard disk or Video CD which is delivering 1.5Mbits/sec. Several companies are now proposing a hybrid system: MPEG video is stored on a CD which works with a browser to blend text from an internet site with pre-packaged video from the disc.

RealAudio 3.0 comes free with Internet Explorer 3, so I tried it on the Microsoft Network. Some of the introductory demos worked well. Other RA 3 showcase sites threw up the error message: "Server alert. You cannot receive this content. Either your network bandwidth is not fast enough to receive this data or your CPU is not powerful enough to decode it". I received the same message day after day, on several RA sites, using an ISDN line and a Pentium 120. If this is not good enough for RA3, then the publicity claims for RA3 are unjustified.

By trial and error, after no useful helpline help, I got an ISDN connection working with CompuServe. As CompuServe has not yet got its act together on the use of browsers, other than the antique Mosaic, it has been impossible to make any meaningful checks on how the service works with facilities that need Netscape or Explorer plug-ins.

Several readers have asked me to give an update on my warning that a new version of WinCim, which bundles with Netscape, renames existing DLL files when it installs. This puts parts of Microsoft Office (including Word) out of action. Well, I tried to get an update. Believe me, I tried.

I first asked CompuServe for comment in July. PR manager, Pauline Blakemore, promised to get back to me with news of a fix and advice on how subscribers can distinguish old, dangerous versions from new, safe ones. In August, I reminded Ms Blakemore I was still waiting. In September, a PR company suggested a meeting. I said okay, if there's something useful to discuss.

By October, I'd heard nothing and copied another reminder to CompuServe's MD, Martin Turner. Phone calls to CompuServe's PR office hit a wall of voicemail and "dial 0 for operator… sorry, there is no operator available".

I have to hand it to Microsoft, the MSN Helpline seems to be coping well with enquiries, although there has been a deluge of calls following the release of IE3. CompuServe is handing the online market to Microsoft on a plate. It is not yet clear whether MSN can improve net access speeds, and make the investment in ISDN worthwhile.

As things currently stand, there is just no point in donating an arm and a leg to BT for an ISDN connection. Stick with analogue 28.8 modems and save your money. If the rules of the game change, I'll keep you posted. ■

Business Matters

Mondex is a card which could replace hard cash forever. Will it catch on? Brian Clegg hopes so.

Brian Clegg

Shops and banks really do not like money. Actually, that's not true. They like it a lot but they hate hard cash. It's a pain. It's bulky, easy to steal, easy to forge, and it takes considerable effort to sort and count. Not surprising, then, that there are several electronic replacements currently on trial.

Probably the best known is the BT/NatWest/Midland venture. The idea of Mondex is simple, as my recent investigation revealed. Instead of carrying coins and notes in your purse, you have a smartcard with a chip that acts as an electronic wallet. A cash machine charges up your card instead of dispensing notes. You then use it in shops, on buses, in phone boxes — wherever there's a reader.

I started out in a sceptical frame of mind. The benefits for banks and traders were obvious; but what about me? Cash might make a bulge in the pocket but it's physical and it's reassuring. What possible benefit could I derive from Mondex? All I could think of was not having to put a pound into those irritating car park machines that refuse to give change. But using Mondex has been a revelation and I'm now converted, so it's a shame the trial is liable to come up with poor results.

"The benefits for banks and traders are obvious [but] what benefit could I get from Mondex? Cash might make a bulge in the pocket but it's physical and reassuring"

I'll tell you the cause of my pessimism in a moment, but first consider the benefits. First up is accessibility. Cash machines are irritating. If, like me, you live in the country, you might drive a long way to reach one. Even in a town, you can rarely park just to get cash. And when you do get there, a queue invariably materialises. And what happens when you get to the front of the queue? The little red flag comes down, it tells you it's closed. The nearest alternative is 15 miles away.

With Mondex the dispenser can't run out, but more importantly, the number of cash dispensers suddenly grows exponentially. Every payphone converted to accept a Mondex card can also download cash from your bank account. Better still, BT can provide you with a home phone with a smartcard slot. Now you can transfer cash between card and account (or from card to card) without leaving home. No need to rush to the bank, it's all there for you. That's real telephone banking and that alone is enough to convince me. But there's more.

The ability to arrange card-to-card transfers via the phone makes it easy to pay off a loan to a friend when you forget your card, or to send money down the line to your daughter who's stuck at a remote railway station without the fare for a ticket. The inability to physically take cash away acts as a deterrent to petty thieves — particularly school bullies who demand protection money, as has been demonstrated at a school trying out smartcard cash. And then there's the internet. Yes, as always, the big "I" gets a look in.

Most people are wary about sending credit card numbers across the internet. You can understand it, even though the same people will often happily order something over the phone using their credit card. Sending credit card data into the electronic void is frightening, especially given the worldwide nature of both the net and the ability to extract cash from your account. Let's do it the Mondex way: pop your card into the phone and transfer an amount of your choice to your PC's wallet, then go online and pay. You have a totally secure firewall. The remote site knows nothing about the source of your cash. Even if someone were clever enough to break the smartcard's security, they can't gain access to it. They only know there's a fixed amount of verified cash they can transfer. It's solid and secure, and will be internationally recognised by the time Mondex comes into full production at the end of 1997.

So why am I gloomy about the trial? Firstly, it only has a small penetration in the population where it's in use; maybe five percent. Then there's the reaction I get from shopkeepers and barkeepers; a sort of raised eyebrow that anyone should be using the thing. None of them has ever admitted having many Mondex customers. Until there's a critical mass of card users, it's bound to seem strange, which means a small-scale trial is likely to fail. Take-up isn't helped by the intention to charge for the card when the trial is over. If the banks could overcome their greed and make do with the huge benefits to them of losing physical cash, and if the trial could be placed in an appropriate context, Mondex and its competitors have a great future. I can't wait to say goodbye to cash. ■

Letters

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Send your letters to:

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NT compatibility blues
I have just moved from Windows 95 to NT 4.0 Workstation on my home PC (a Gateway P90 with 32Mb of RAM). My experience in doing this may well be similar to others who have made the same transition.

I have a "top-of-the-range" Logitech mouse and I value the facility to configure the middle button to act, for example, as a double-click. Unfortunately, there are no manufacturer-supplied NT drivers and this facility is unavailable under NT.

Logitech informed me it has no immediate plans to issue NT drivers. My NEC double-speed CD-ROM, which came with my computer, is not supported by NT, either.

The solution was to buy a new CD-ROM, so I bought a Creative Labs eight-speed and even this was hit-and-miss as the packaging mentioned 3.x and '95 but not NT. Winfax no longer functions and I am having trouble finding a fully NT compatible alternative.

Workstation is a sensible alternative to Windows 95 in many SoHo environments and the cost of the necessary processor/RAM is constantly falling. I would encourage you to feature NT compatibility in your reviews in addition to covering NT-only products.
Richard Alberg
via the internet

PCW replies: Your experience of NT is not unusual and is a reason why many users are happy to stick with Windows 3.x/95 for now. No doubt NT will grow in importance and this will be reflected in the pages of PCW. Meanwhile…

CD or not CD?
What has happened to my CD in the December issue? It's gone all square and old-fashioned looking and I can only locate about 1.4Mb of software. Is this a new form of DVD? Or have you discovered some highly secret data compression software, that I don't yet know about, which packs 600Mb onto a floppy?
Ian Bostock
via the internet

Pricing out the pirates
Having read your article about software theft ("Crime Buster", *PCW* November), I would like to make my own opinions known. I believe the main factor causing software theft is cost. The price of software is prohibitive, and particularly so for home users and small businesses. Who can afford to pay the full cost of Office, for example?

I still use Word 2 and Excel 4, bought at a knock-down rate when the later versions were released. Software companies could protect their software but don't want to suffer the costs involved. They want to maintain their high margins — margins which appear undented by theft. Are the prices high to ensure legitimate users subsidise the pirates?

The loss attributed to software theft is questionable; I assume they estimate the number of illegal copies and then multiply this by the retail value. If there were a foolproof way of preventing theft, it is doubtful whether the companies would sell substantially more copies of their software. People would not pay. They would simply purchase the cheaper products or use what is in Windows (Notepad and so on).

£10m-worth of counterfeit Microsoft software goes up in flames on Clapham Common, in London (see "Pricing out the pirates")

I suspect that reducing the cost of packages to a reasonable level would mean more people would be likely to buy legal copies and the real problem would be attacked: that of organised crime replacing legitimate copies in the channel. The chances are, such a step would boost sales over the higher-priced products. The marginal cost of such sales would be minimal since software reproduction is relatively cheap.

My moral sense, coupled with the fact that I work in computers and view piracy as threatening my job, dictates that I don't copy software. If it is easy and good value, I register shareware, otherwise I do not use it. I believe I am probably in a minority.
Mike Bennett
via the internet

NT overdose
Please tell me, what *is* going on? For some years now, you have published the best computer magazine by far. If a new product was released, never mind the platform, we could expect a concise, unbiased review. Yet this ability seems to have been lost.

For the past four months, we have been hearing about Windows NT 4. Certainly this is a major upgrade to Microsoft's only operating systems with a future beyond the x86 chip family and so deserves good press coverage. Yet what about OS/2 Warp 4.0? This is just as important and will prove to the computer community at large that OS/2 *can* be taken seriously. The number of innovative technologies, not to mention the best integration with the internet offered on any

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platform, is simply astounding. Name another OS which has a great interface, voice dictation, plug-and-play on PCI and ISA buses, OpenDoc, Java built in, and is able to be diagnosed and upgraded directly from the internet. Let's not forget that Windows only became a true OS in version 4, and Warp still beats it in many ways.
Stuart Clark
Richmond-upon-Thames

PCW replies: *We are planning to conduct a group test of the leading operating systems, including OS/2 Warp 4.0, in the very near future.*

Nobody's fool
I first heard of fake cache in a rival magazine, just before *PCW* announced it. Given that it was published around April, my first thoughts were that this was an elaborate April Fool's joke, but out of curiosity I ran cachechk.

Surprise, surprise, it reported fake cache! When the subsequent issue of *PCW* was still giving space to this "scandal" and suggested readers check their cache, I began to worry. Surely if this was merely a joke it should have been leaked by now?

The postings on Usenet suggested it was all a scam based around what the real definition of "write-back" cache was. In many cases, buyers were claiming to have received refunds or replacements when suppliers had been threatened with legal action. So what was *PCW* (having made what I considered a fairly big deal about this) doing about it? Nothing apparently! Was it just a big joke, as the supplier of my 256Kb cache motherboard claimed? Or did it die a death as buyers began to demand "proper" cache?

Perhaps I was taken in, since I looked at several different diagnostic programs (all of which said my home machine had no cache, yet happily found it on various work PCs) before approaching my supplier. The answer was that this was obviously a big joke since they had never heard of fake cache, only used reliable sources, and anyway, there was no reliable cache-checking programs available to the likes of me.

Denying that anything was wrong, the company responded that I had asked for 256Kb cache and had got exactly that. If I wasn't happy I could return the board which, even though it was out of warranty, would be tested to prove that the cache was there. The company said the BIOS was reporting cache present, so what more evidence did I require?

So what about it? Having started this, are we ever to see either a follow-up to this story or an announcement telling me and probably quite a few others, that it was all a big joke!
Richard Knight
via the internet

PCW news editor, Clive Akass, replies: "*There are, without doubt, boards around with dummy cache chips: some were inserted by manufacturers to reassure buyers of boards intended for non-cached machines; a practice you might consider at the very least to be reckless. Other boards appear to be deliberately fraudulent. Some advertisements for both types have been misleading to the point of fraud, although to be fair, some dealers have themselves been caught out.*

Cachechk gives misleading results on some setups. A "lite" version of the commercial program, PC Checkit, is available from our web site and should be more reliable. You cannot, however, rely on BIOS messages: I have a board which reports 265Kb cache even if you take the chips out. Any cache chips with Writeback. or WB, stamped on them are almost certainly dummy.

Get a life
Why, oh why, do your contributors keep going on and on and on about CompuServe being expensive — there's at least one more such comment in your December issue.

I find the sums quite simple: CompuServe costs me £6.20 per month, and everybody else charges at least £10. Okay, so in a month when I spend several extra hours online browsing airline timetables, it costs a little extra, but that's only once or twice a year. Surely for many people the annual cost with CompuServe will be much less than with anyone else?

Maybe it's just that *PCW* contributors don't have real lives to get on with and are in the tiny minority who spend so long online that CompuServe really does cost more?
Tim Ward
Cambridge

PCW replies: *How dare you suggest we don't have real lives! We all go out regularly — to the coffee machine, the pizza parlour, the toilet etc.*

Costing it out
The group test on inkjet printers (*PCW* November) was thorough and covered nearly all the points I needed to know. But one point I would have liked covered is the cost per page of printing (or just the number of pages each cartridge lasted during the test, if you wanted to eliminate the costs of different sorts of paper).

I know you listed the makers' claims, but that is not the same as an independent test against which those claims may be measured. Running costs can be as important as capital costs for some of us.

I found it puzzling to have the HP870Cxi (your Editor's Choice) described as having a "four-colour CMYK cartridge set-up" while in your Table of Features at the end of the report, costs are given for a three-colour cartridge and a mono cartridge.

The complaint made time and time again in reviews of colour inkjet printers in various magazines, ever since these printers were developed, is that you have to throw away the cartridge when only one colour is exhausted.

This complaint is magnified when a four-colour cartridge has to be disposed of when the black is used up. Can you refill any of these cartridges? All manufacturers will advise against it, but you can take an independent view and can tell us what the advantages and disadvantages are, or even if it is impossible.
Norman Coats
via the internet

PCW's Eleanor Turton-Hill replies: *Our first priority in testing inkjet printers is to provide accurate results in two categories: performance and output quality. Unfortunately, cost-per-page tests are impracticable during the short time-frame within which we have to review products.*

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Eating humble pi

I imagine you will have been bombarded with letters pointing out to Michael Hewitt that pi is 3.1415926536 to ten decimal places, not 3.1428571429. I propose that he be forgiven, provided he explains clearly a method of using a slide rule to calculate pi.
Mark Burch
via the internet

You're right — here's the other one…

Pi-eyed or Pentium problems?
As a retired computer science lecturer, I read Michael Hewitt's article in the December issue with some interest — and some sympathy, until I saw his "calculation" of Pi . His "teaching by rote" upbringing did not I fear, get him, to understand that the ratio of circumference of a circle to its diameter can only be approximated to, and that $^{22}/_{7}$ is just a convenient fraction giving the value to three places of decimals, not the ten or so he quotes. Shades of rounding errors in computer calculations!

Children use PCs to calculate sums, rather than using their heads, according to Michael Hewitt

Shock horror, the Pentium miscalculates! The modern methods he denigrates are intended to give pupils an understanding of mathematics ("internalisation" in the jargon) that is easily overwhelmed by the sheer mechanics of "doing sums", hence the hopefully limited use of calculators. Whether the methods succeed is, as always, down to the ability of the teacher to enthuse his pupils. I still work faster on a slide rule than an adding machine.
Bob Bowker
via the internet

Accurate testing to measure the cost per page for each printer in a group test would involve exhausting the cartridge (or cartridges) in each printer several times over — a time-consuming and ultimately unrealistic test.

As for the term "four-colour", this is generally used to distinguish a printer from the cheaper "three-colour" models. The demarcation between the two types of architecture is crucial in a round-up of budget inkjet printers, where CMY and CMYK models offer different sets of pros and cons.

In the review of the HP870Cxi, this is made clear in the sentence "no need for swapping black and colour cartridges as all are included on one easy-to-install unit". See the section in the group test called "How inkjets work".

Ink chemistry is an area which we could research more thoroughly, and it's certainly true that manufacturers advise against refilling cartridges to protect the market for their own consumables. We'll certainly consider including a section on how refill ink affects quality in our next group test.

Microsoft Plus! — and minus

Some years ago, Microsoft created a club for its customers called "Microsoft Plus!". It offered members a magazine with news, software tips and special offers on Microsoft products. There was also a membership reward scheme for registering, which could be redeemed for new products. However, you had to wait for up to three months before you could get the products for your points, and you couldn't obtain upgrades with your points, only the full product.

Then Microsoft decided to use the name "Microsoft Plus!" for the extra bits of Windows 95 it ought to have put into it in the first place. So it changed its name to "Microsoft Advantage". That was no better. So it created "Microsoft Advantage Gold" and charged extra for all the increased benefits of belonging to "Gold".

When it was called "Microsoft Plus!", I had a windfall and decided to pay up and join to the year 2000. Now Microsoft has removed all the advantages of belonging to "Microsoft Advantage": the points system has been abolished, and in the latest edition of the magazine there is no special offer for members. All we get is a rather scrappy magazine singing the praises of Microsoft with 32 pages of "Hints and Tips". This is the only good thing about it, except that most of it is old stuff which anyone who has been using Microsoft products for more than two years will already have discovered for themselves.

The whole point of belonging to "Microsoft Advantage" was that we were to be given insights into ways we could do things with Microsoft software that we could not get anywhere else — "ideas that only Microsoft could give us," it said.

I am somewhat disillusioned with Microsoft. Were it not for the fact that I believe Word to be the best word processor and Excel the best spreadsheet, I think I would be getting out from under. There must be a lot of folk about, like me, who feel they have been conned.

Rev. Cyril Blount
West Yorkshire

Microsoft was asked to comment, but unfortunately we had not received a reply from the company by the time this issue went to press. ■

Best of **Gadgets** 1996

PCW Gadget Photography by David Whyte. **Compiled by** Gordon Laing.

Fortes VFX1

The Fortes VFX1 is *the gadget extraordinaire* for those who can lay out the dosh. Run down the corridors of Doom or rocket and blast your way through Descent. Either way, you're in the thick of it. The VFX1 is only compatible with certain graphics cards so phone 5DT before you buy.

RRP £789 (plus VAT).
5DT (Europe) 0181 974 2044

NEC Silicon View

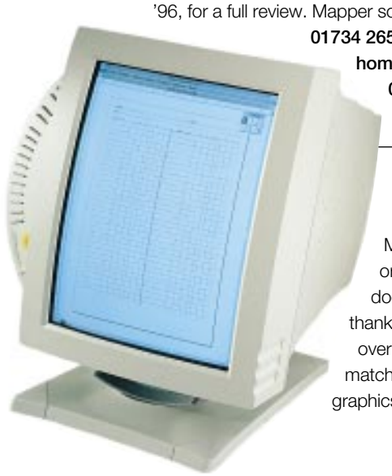
Today, the megabytes required to store a movie on a credit card costs a fortune. But dream of the future with this prototype from NEC, hitting the stores in time for Christmas 1999.

NEC Europe 0171 353 4383

GPS mapping for Psion Series 3a

Every James Bond gadget-fanatic's dream comes true with cables to connect the Series 3a to a variety of Global Positioning System (GPS) devices. See *PCW*, March '96, for a full review. Mapper software and cable from **Steve Litchfield** on **01734 265081; http://ourworld.compuserve.com/homepages/slitchfield.** GPS unit from **Garmin 01794 519222**

ADI MicroScan 17X



Most users work on A4 portrait-orientated documents, yet own landscape-orientated monitors. Until now, in order to view full-size A4 portrait documents you've had to invest in huge, expensive 21in monitors. But thanks to ADI and its 17in swivel monitor for Windows, those days could be over. Simply rotate the display, press a hot-key, and the image instantly flips to match the new orientation. No restarting Windows, and it works with most graphics cards. **ADI Systems UK 0181 236 0801**

IBM PalmTop PC 110

How about running Windows 3.1 on a 630g palmtop? This IBM wonder features a 486SX processor, 4.7in colour LCD display, infra-red and full internet access. Sadly, it's still only available in Japan. Do you want one? Of course you do. Base configuration starts at 169,000 yen (that's just over a grand). Return flights to Tokyo from around the same price.

IBM 0345 727272; www.ibm.com

Nokia 9000 Communicator

Is it a mobile phone? Is it a PDA? Is it a world wide web browser? No, it's all three! The remarkable Nokia 9000 also throws in fax, email and diary software, in the most complete mobile communications solution yet. There was a full review in *PCW* June '96.

Street price approx. £1,000 with a line. Nokia 0990 002110

Kodak DC20

Kodak's DC20 digital camera is about as consumer friendly as you can get. The 1Mb internal memory can store up to eight images at the highest 493 x 373 pixel resolution or 16 images at the lower 320 x 240. It is fully automatic and sets the focus and exposure for you. Full review next month.

SRP £349 (incl VAT). Kodak 0800 281487; www.kodak.com

Nakamichi SP-3d

Nakamichi's SP-3d speaker system leaves the largely non-directional deep bass sounds to a single sub-woofer unit. Pop this out of the way and leave the medium- to high-frequency stereo work to a pair of small, magnetically-shielded satellite units. Available in black or white from about £120, they'll significantly enhance your multimedia experience. Reviewed in *PCW*, September 1996. **AGP Distribution 01264 336991**

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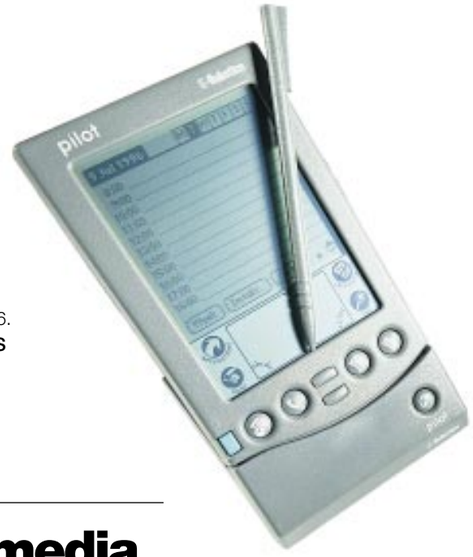
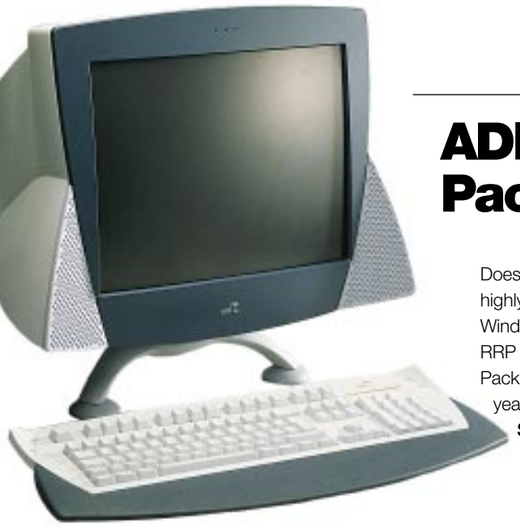
Palm Pilot 5000



The Palm Pilot is small enough to slip into your shirt pocket, yet powerful enough to recognise handwritten text using simplified Graffiti script. It has organiser software, a docking station that plugs into a PC or Mac, and it can reconcile files on the linked machines at the touch of a button. Prices range from £279. See *PCW*, September '96. **Pilot 5000 £349; Pilot 1000 £279; memory upgrade £129 (all prices plus VAT). US Robotics 01734 228200**



ADI Duo Multimedia Pack

Does your computer look boring? Then consider ADI's highly-stylised Duo Multimedia Pack, consisting of mouse, Windows 95 keyboard and 17in multimedia monitor. RRP £589 (plus VAT). ADI says the Duo Multimedia Pack will navigate you from the stone age to the year 2000 — ya-ba-da-ba-Duo indeed. **ADI Systems UK 0181 236 0801**

Nintendo Gameboy Pocket

Gameboy Pocket is compatible with existing cartridges but is smaller, lighter and in a metallic case. £49.99 (incl VAT). **THE Games 01703 653377**

Nintendo 64

Nintendo's long-awaited 64-bit games console was reported to have sold a quarter of a million units on its first day of sale in Japan. It has just come out in the US but we'll probably have to wait until Easter '97 for the UK PAL units. It has an expected price of £250 (plus VAT) just to play the remarkable Mario 64 game. See *PCW*, October '96. **THE Games 01703 653377** (they don't have any for sale yet).

Sony DSC-F1

Sony's first consumer digital camera has an LCD viewing screen, 640 x 480 pixel resolution, and its 4Mb flash memory can store 108 pictures in economy mode, 58 in standard or 30 in fine. Images are transferred to a PC by built-in infra-red or serial interfaces. UK pricing is unknown but both products go on sale in the US this month at $800 for the camera and $590 for the printer. **Sony IT group 0181 760 0500**

Taxan Crystalvision 650

Taxan's 650 has a 14.5in colour TFT panel capable of resolutions up to 1024 x 768 pixels at 75Hz, measuring only 2.5ins thick! It is TCO 1992 compliant, has built-in speakers and connects to normal analogue VGA video cards. See *First Impressions*. **RRP £2,899; street price £2,175 (both plus VAT). Taxan 01344 484646**

Nikon CoolPIX 100

Nikon's compact CoolPIX 100 is one of the most innovative digital cameras we've yet seen. The battery pack slides off the main unit to reveal a PC Card which slots straight into a PC for direct image transfer. The CoolPIX 100 features a 480 x 512 pixel resolution, 42-image capacity (in normal mode), built-in flash, auto-exposure, self-timer and macro close-up mode. It measures 60x152x33mm and weighs only 160g without battery. See next month's digital camera group test. **Nikon UK 0800 230220**

Microsoft Sidewinder Gamepad

Microsoft can take you one step closer to the games console experience with a joypad games controller for PCs. The Sidewinder Gamepad, costing £39.99 (incl VAT), boasts six buttons, two triggers and the eight-way pad controller familiar to all console addicts. It's Windows 95 only, can be reprogrammed, and you can even have up to four daisy-chained together — Nintendo, Sony and Sega, watch out! **Microsoft 0345 002000**

First Impressions

First Impressions leaps straight in to review the new **IBM PC** (below), plus a head-to-head between a **Mac** and a **Umax Mac** clone (p74). **Kodak** shows its tiny Snapshot scanner (p82), and a late beta of **Acrobat 3.0** gets a *PCW* once-over (p84). We wade through the mass of **multimedia encyclopaedias** and design **Barbie's** winter wardrobe.

Contents

Ratings

★★★★★ | Buy while stocks last
★★★★ | Great buy
★★★ | Good buy
★★ | There's a better buy somewhere
★ | Buy it and weep

VNU European Labs

VNU Labs tests cover every kind of hardware and software including PC hardware, printers, network products, modems and software applications. The tests are continually developed and enhanced to reflect hardware and software developments. Our suite of PC benchtests uses complete versions of industry-standard Windows 95 applications — currently Word, Excel, WordPerfect and FoxPro. We also run a graphics re-draw test using CorelDraw 6, and a Doom 2 frame rate test which is a good indication of games performance.

Application tests are the backbone of all the VNU Labs system evaluations but it's nearly impossible to pin an application result to a specific machine component. Only system-level tests (also known as low-level tests) can reliably tell the difference. VNU Labs' system-level test suite is called Euromark. Mainly Windows-based, it is used to isolate specific components like hard disks, graphics cards and CD-ROM drives.

● All graphs in *PCW* are drawn so that the bigger the bar, the better the result. Normally we'll also include the original data we worked from: for example, the time in minutes and seconds to print a page in a comparative test of printers.

Hardware

IBM Aptiva S-series

Slick, good-looking and a sure sign of IBM's revival.

One of the nice things about exclusive first looks is that you get to gaze into the future and see what brave new products are coming. Judging by this pre-release IBM Aptiva S Series, codenamed the Stealth, the future looks very good.

IBM has undergone a lot of change in its PC division lately and the results are finally beginning to show. Once known to produce sluggish, just-behind-the-times PCs (see *PCW* August 1997), it can now be said that IBM is at the vanguard along with the rest.

The first thing to strike you about the new Aptiva is that does look very Stealth-like. The charcoal grey colour of the whole unit, from monitor to mouse, adds an air of class not normally associated with a PC. The move to dark grey from vanilla white is reminiscent of the colour switch stereos underwent, from silver to black, in the early eighties. I liked it then and I like it now.

The design of the S Series is unique and IBM obviously put some thought into it. It consists of three main components: the PC, the media console and the monitor.

The PC is a mini-tower that holds the brains of the unit, from the CPU to the 28.8 IBM modem, but there are no outward facing devices, like the floppy or CD-ROM drive, let alone a power switch. This gives the tower the look of a sleek office server that can be stashed away under your desk.

Our review unit came with a Pentium 200MHz chip but when the Aptiva starts to ship next year it will have the new Intel Pentium 200MHz CPU with MMX capability. All the I/O is hard-wired into the motherboard so there is a minimum of cabling on the inside. IBM has also incorporated a Universal Serial Bus (USB) port to accommodate new USB-enabled peripherals expected next year.

There's plenty of room for expansion as there are four ISA, one PCI and one shared PCI/ISA slot, all located on a riser board. This is standard to IBM PCs, but why they need to do it eludes me. The Aptiva S Series comes with a whopping 3.2Gb hard drive which has been neatly divided into four partitions. This is a nice touch by IBM as it avoids loss of storage space to under-used clusters. 3D graphics capability, using the ATI 3D Rage II chip, with 2Mb of SGRAM is also included. There will be 16Mb of SDRAM, as opposed to EDO RAM, which will be upgradeable to 64Mb.

The media console is the hub of the machine and fits comfortably on the monitor stand just beneath the monitor. It holds both the floppy and CD-ROM in a nifty James-Bond-like spring-loaded hide-away unit. Press once on the top of the console and up it pops. The only other button on the console is for power and that's it. All control from the console is transmitted through a single cable that plugs into a proprietary ISA card in the PC.

The monitor we looked at was an IBM MM5015in model. Stereo sound and microphone capability is built directly into the 15in monitor, but there are mic and headphone ports if you need to use them. A sub-woofer, standard with the S Series, plugs directly into the rear. The audio output quality was good, and the only fault we found was that the mute option built into the monitor didn't work on the sub-woofer.

The custom start-up interface, perfect for the novice, and software bundle are impressive. Everything from a CD player to Lotus Smartsuite to a Netscape browser is included on the Aptiva.

Dylan Armbrust

PCW Details

Price Expected to be in the region of top-of-the-range current Aptiva — approx. £2339

Contact IBM 0990 727272

Good Points Good design, great software bundle and utilities.

Bad Points Can't mute sub-woofer and only two PCI slots.

Conclusion IBM is catching up with the times. If it performs as good as it looks, they'll have a real winner.

★★★★

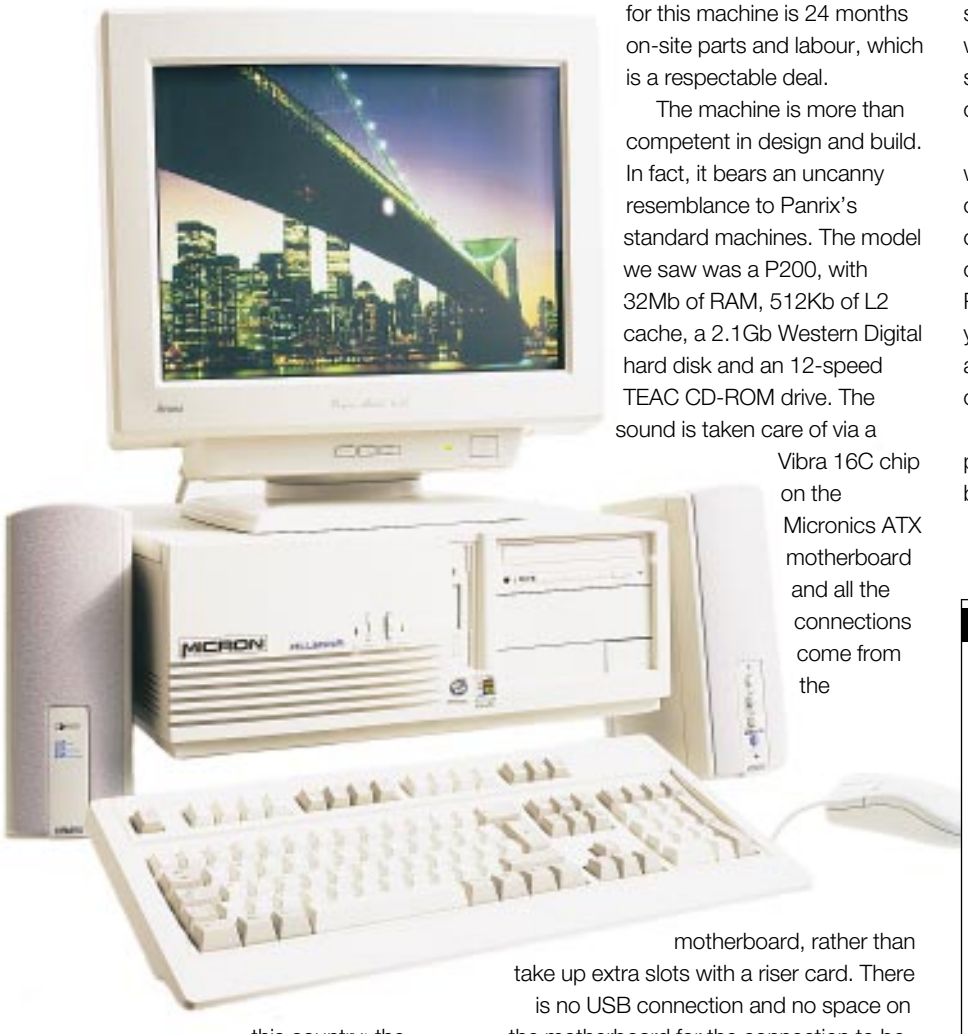
p72 ➢

Hardware

Micron P200

Superior build quality makes up for slightly slow performance speeds.

Micron is not a name many people will be familiar with in this country, but it is very well known in the States. In fact, it is one of the biggest PC vendors in the States. Panrix has snapped up the sole distribution rights in this country; the company says the deal came about as it has the same philosophy on marketing and build quality, but is also aiming at the same section of the market.



The deal between Micron and Panrix is quite simple. Micron ships over boxes which are 100 percent assembled, with the motherboard, hard and floppy drives and most of the system software already installed. Panrix will supply the monitor and will change any hardware specs you would like upgraded, for example if you want a larger hard disk or more RAM or a tape backup. The machines are well-speced to start with so the need for a larger hard drive will not be pressing for the average buyer.

The warranty and technical support are taken care of by Panrix itself. The warranty for this machine is 24 months on-site parts and labour, which is a respectable deal.

The machine is more than competent in design and build. In fact, it bears an uncanny resemblance to Panrix's standard machines. The model we saw was a P200, with 32Mb of RAM, 512Kb of L2 cache, a 2.1Gb Western Digital hard disk and an 12-speed TEAC CD-ROM drive. The sound is taken care of via a Vibra 16C chip on the Micronics ATX motherboard and all the connections come from the motherboard, rather than take up extra slots with a riser card. There is no USB connection and no space on the motherboard for the connection to be added. There is plenty of expansion room, with three PCI-only slots, three ISA-only slots and one shared slot.

The graphics card was the Diamond Stealth 3D 2000 Virge, one of the new breed of 3D graphics cards, with a stonking 4Mb of DRAM. It is a consumer model so we were a little surprised to see it here. For a run-down on its big brother, the 3000, see our 3D graphics card round-up on page 210. Also included are a V34 modem from Diamond and Yamaha speakers.

The bundle includes a version of Office 95 Professional, while the version of Windows 95 includes Internet Explorer 3.0 and the Plus pack, all on one CD.

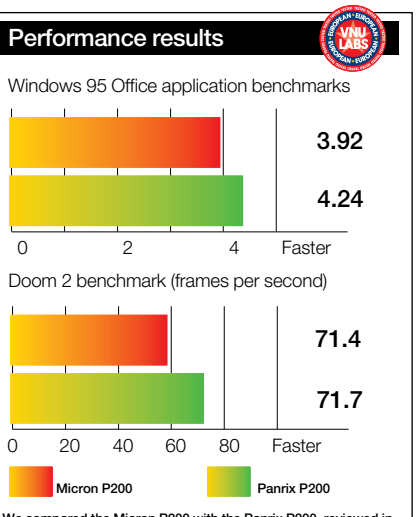
The performance was on a par with other P200s with 32Mb of RAM we have seen, but was down a few points. However, when we are talking about these sports of speeds, a few points is not that important. It certainly does not feel like a sluggard.

As for the price, it compares reasonably with other P200s, but it is not the cheapest on the market. Compared to a number of other manufacturers, it is slightly over the odds, but the inclusion of Office Professional rights this balance. That is, if you bundled Office Pro with other systems advertised this month in *PCW*, you would come out at a price very near this one.

All in all, it is a sound choice from all points of view: build quality, software bundle, performance, warranty and price.

Adele Dyer

Performance results



We compared the Micron P200 with the Panrix P200, reviewed in *PCW* August 1996. The application benchmark score of the Micron is a little behind that of the Panrix, but that was a SCSI system. The Doom II scores are practically identical, however.

•PCW Details

Price £2265
Contact Panrix 0113 244 4958
Good Points Good build quality.
Bad Points Performance slightly below par.
Conclusion A good, solid choice.
★★★★

p74 ➢

Hardware

Apple PowerMac 9500/200
Umax Pulsar 200

One-to-one combat between the PowerMac and a new clone from the scanner people, Umax.

After a slow start, Apple's attempts at encouraging third party manufacturers to license the Mac OS are starting to bear fruit.

Power Computing has already established itself as the premier Mac clone manufacturer, and its Power Tower range has been giving Apple's PowerMacs a really good run for their money. Now Umax, best known in this country for its scanners, has joined in with its Pulsar and Apus ranges.

The Apus range consists of PowerPC 603e-based entry-level machines, similar to Apple's Performas, while the Pulsar range is based on the PowerPC 604e and competes head-on with the PowerMac range.

To see what Umax has come up with we compared Apple's PowerMac 9500/200 with the Pulsar 200. Both machines are based around a 200MHz PowerPC 604e processor and represent the top-of-the-range for each company's current products. Their prices are quite similar, with the Pulsar costing £2,995 and the PowerMac dropping to £2,875 following Apple's recent price cuts.

All Mac clones are based on Apple's own motherboard designs. That means that clone manufacturers don't have too much scope for producing their own variation on the standard Mac theme. However, like Power Computing, Umax is proving that it can come up with competitively priced Mac-clones that have their own attractions.

Externally, the two machines are easy to tell apart, thanks to the scalloped edges of the Pulsar's tower case and the door plate that closes over the CD-ROM and floppy disk bays. Open that plate and you'll see the engraved signatures of the Umax design team, as well as a dedication to "all those who kept the faith". Presumably "the faith" refers to the loyalty of Mac users who have kept the platform going even through Apple's recent mega-million dollar losses. That's touching, but it's hardly a major selling point.

Fortunately, there are some more substantial things to look at on the inside. The stand-out feature of the Pulsar range is that they are all capable of dual processor support. Like Apple's PowerMacs, they carry their CPU on a replaceable daughter card in order to provide an easy upgrade path. Unlike the PowerMacs, the Pulsars all have a slot for a second processor card on the motherboard. A number of high-end Mac graphics applications, such as Photoshop, have already been rewritten to provide dual-processor support, so this is a useful upgrade option for graphics users.

Apple's PowerMac 9500/200 doesn't have dual-processor capabilities, although there is a second 9500 model, the 9500/180MP which is supplied with two 180MHz 604e processors and priced at around £3,500. This means that Apple's product range allows you to buy a single-processor or a dual processor model, but Umax gives users the freedom to buy a single processor model and then upgrade when it suits them. And, of course, the Pulsar will accept two 200MHz processors, compared to the 180MHz processors in the 9500/180MP.

The Pulsar will accept both DayStar's multi-processor card and a planned card from Umax. UK pricing for these was unavailable as we went to press, but it's good to know that you're got a choice of options for this upgrade.

The Pulsar has a maximum RAM capacity of 1Gb, compared to the 9500's maximum of 768Mb. Admittedly, there aren't many users who will actually need 1Gb of RAM, so this isn't a major advantage. What is nice about the Pulsar, though, is that the layout of its motherboard provides much easier access to the RAM slots when you do want to upgrade. The RAM slots in the 9500 are completely inaccessible, and you have to take the entire thing to bits to get at them.

The 9500/200 does include 32Mb RAM as standard, compared to the Pulsar's 16Mb. Bringing the Pulsar up to 32Mb, which most owners of a high-end machine would probably want to do, will make it a good £200 more expensive than the 9500/200. However, don't be at all surprised if Umax' response to Apple's price cuts is to increase the Pulsar's standard RAM complement to 32Mb by the time you read this.

Apart from those differences, the

p77 ➢

features of the two machines are almost identical. They both have a 2Gb hard disk, 512Kb of level 2 cache, 2Mb VRAM on their graphics cards, and 8x CD-ROM drives. Both motherboards have six PCI slots, with one slot occupied by the graphics card, so their expansion capacity is the same. For networking, both machines have built-in 10Base-T and AAUI Ethernet interfaces.

With similar specifications, it's not surprising there's little difference in performance. The Pulsar did nudge ahead on both CPU and hard disk performance, but the difference was less than one percent — too small to make any practical difference.

The only real performance difference came from the two machines' graphics cards. The 9500/200 scored better than the Pulsar on video performance, according to our benchmark software. This difference was confirmed when running real-world tests in Photoshop, with the PowerMac 9500 proving five to ten percent faster when applying a series of filter effects.

Apple's PowerMac has a edge in terms of speed, but it is the more expensive by almost ten percent. So, in terms of overall price and performance there's not much to set the two apart. The 9500/200 comes with an extra 16Mb RAM as standard, but the Pulsar's dual processor upgrade option will appeal to the high-end graphics users, for whom a machine like this is designed. The Pulsar has some bundled software, in the form of FWB's CD-ROM and Hard Disk utilities and a copy of ClarisWorks 4.0.

The Pulsar doesn't blow the 9500/200 out of the water, but there's no doubt that it's every bit as attractive as the "official" Apple product. Power Computing currently holds the top spot in terms of sheer horsepower, with its 225MHz Power Tower, but Umax is also about to release its own 225MHz version of the Pulsar. At less than £3,000, the Pulsar 200 suggests that Umax deserves to be taken seriously as a Mac clone manufacturer.

Apple is now back in profit and rumoured to be planning price cuts in order to compete head-on with the clone manufacturers. And, with Motorola's StarMax clones waiting, Mac users now have more choice, and more cause for optimism, than they've had for a long time.

Cliff Joseph

PCW Details

Apple PowerMac 9500/200

Price £2895

Contact Apple 0181 569 1199

Good Points High performance, 32Mb RAM.

Bad Points No dual-processor support, RAM upgrades awkward.

Conclusion Powerful machine, but not clearly superior to its clone rivals.

★★★★

Umax Pulsar 200

Price £2,995

Contact Umax 01344 871306

Good Points High performance, dual processor support.

Bad Points Only 16Mb RAM as standard, video card a little sluggish.

Conclusion An affordable PowerMac alternative and more easily upgradable.

★★★★

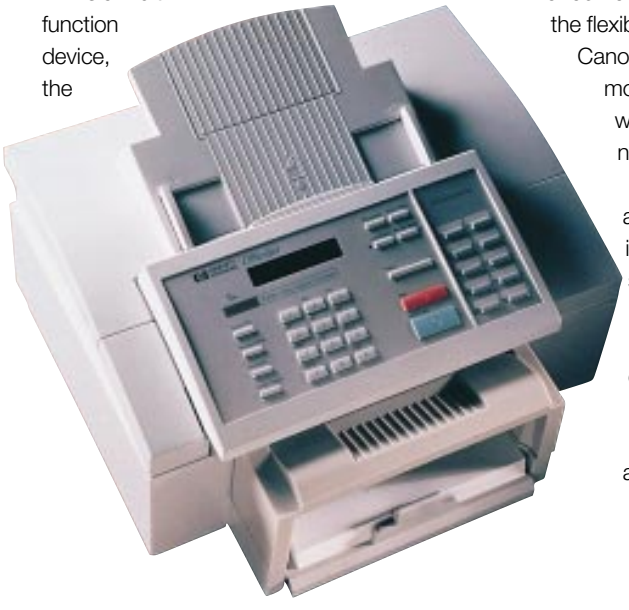
Hardware

HP OfficeJet

A monochrome multi-function device, perfect for the busy office.

The OfficeJet XL was one of the first multi-function devices on the market and also it was the predominant product of its type. The OfficeJet 350 is this year's update. It has been spruced up and refined, but is essentially the same product as the XL.

As a multi-function device, the OfficeJet 350 can print, scan, fax and copy. It can, of course, be controlled entirely from the desktop over a network, taking the strain off the queues around the fax machine. The printing capabilities are taken care of by an inkjet, which has a maximum printing resolution of 600dpi. It is, of course, only a monochrome printer, so you do not have the flexibility of a colour as on the Canon MPC30 reviewed last month. However, for a business workhorse, colour is probably not a priority.



The printing quality is good, although recognisably from an inkjet. You can print to three standards: economy, normal and best. The best mode gives very good output, but it does not sacrifice speed. It can print on a number of media, including envelopes and transparencies.

You can scan at either 200dpi or at 300dpi. The scan is automatically loaded into the fax software package, Eclipse.

Also included in the deal is Caere OmniPage Limited Edition, which is a cut-down version of OmniPage Pro. It is a commonly bundled with scanners and is an efficient package, if limited in functionality.

Of equal quality is the copier. This function appears to give better scanning results than the scanner itself, with the prints produced being of nearly the same quality as pages printed straight from your word processor.

Adele Dyer

PCW Details

Price £650

Contact Hewlett-Packard 0990 474747

Good Points Excellent quality all round.

Bad Points No paper tray to catch sheets faxed and copied.

Conclusion A sturdy workhorse.

★★★★

p78 ➢

Hardware

Epson Stylus Color 200

A new and improved bottom-of-the-range printer which needs some heavy-duty cleaning.

Epson has just revamped its bottom-of-the-range product, moving on from the Stylus Color IIs to the Stylus Color 200. Like Epson's other printers, it uses Epson's proprietary piezo printhead technology.

The Stylus Color 200 is a single-cartridge, three (CMY) colour printer, unlike the 500 which is a two-cartridge, four colour printer. You can swap out the colour cartridge and replace it with a black cartridge if you want to print in mono. It is not just the cartridge which swaps, it is the cartridge holder as well.

The use of a swappable cartridge is never entirely satisfactory on any printer as when the colour cartridge is in, it can only produce composite black and not process black, but the Stylus Color 200 does manage to acquit itself rather well in this respect. While the composite black produced is obviously not as good as process black, it is at least recognisably black and does not look an unhealthy brown or grey like the composite black produced by other printers. The process black from the Stylus Color 200 is also an improvement on that of its predecessor, the Stylus IIS, which was a little light in tone.

The drivers on the Stylus Color 200 have been tweaked to let you get the best results from stills taken from a video camera, or snaps taken with a digital camera. This is an interesting development in the light of the growing predominance of the digital camera (see next month's issue for a full round-up of the digital camera market).

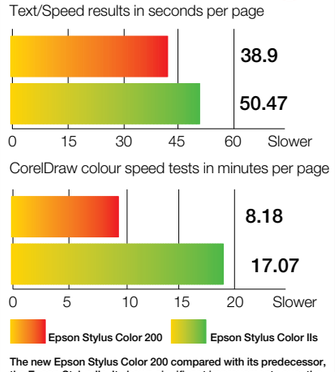
In common with Epson's other printers, the Stylus Color 200 has a top resolution of 720dpi. The results of this are impressive, especially on Epson's special 720dpi paper. Obviously, this takes a little more time. If you choose to print text at 720dpi, one full page of text will take nearly seven minutes. However, if you drop the resolution to 360dpi, this is speeded up to just over a minute. The drop in quality is noticeable for text, but the output at 320dpi is still perfectly respectable. The difference to quality that the 720dpi paper makes is a moot point. The paper is not cheap, costing £10.99 (RRP) for just 100 sheets and so it is not something you would want to use all the time. However, for printing good quality "photo-real" pictures at 720dpi, it is invaluable.

In our Corel test, the output was excellent. The colours were vibrant and solid. There was some banding, but you had to squint at the paper from close quarters to see it. Epson's new "Auto-Color" function helps to get the colours right, as it scans the paper page and automatically makes settings for the best quality output. It was also able to produce the hairline. The time for this test was also not outlandish, coming in at a very respectable eight minutes and eighteen seconds. The quality of output is obviously not as good on copier paper, for example it cannot produce the hairline, but it is still respectable.

There was one problem we encountered. When we installed a new colour cartridge we needed to run the cleaning cycle three times. We ran it once after installing a new cartridge as the manual recommends, but when we tried printing the yellow did not come through. After a second cleaning cycle, the magenta stopped flowing half way through a sheet. A third cleaning cycle put this to rights and this may have just been a one-off problem with the cartridge, but it was a little disappointing. However, the cleaning cycle is mercifully brief, taking only a few seconds to complete.

Adele Dyer

Performance results



The new Epson Stylus Color 200 compared with its predecessor, the Epson Stylus IIs. It shows significant improvements over the IIs, both in speed and in quality, most dramatically shown in the CorelDraw results.

PCW Details

Price Street £174 (incl VAT)
Contact Epson 01442 61144
Good Points Good colours, accurate printing.
Bad Points Cleaning cycle may have to be run repeatedly for new cartridges.
Conclusion Excellent output for the price.
★★★★

p79 ➢

Hardware

Canon 620

A capable colour printer with ink wells that can be replaced individually.

The Canon BJC 620 is this year's update to last year's BJC 610. Essentially, it is the same printer but with a few updated features and a lower price. As its predecessor, the 620 has a top resolution of 720dpi. The 620 is a single-cartridge, four-colour CMYK printer with a difference; handily, the four inks come in separate wells so that each can be replaced individually.

The printer itself is easy to install. It worked first push and there were no problems with the cartridge. But when you first start to print, it does take a while. It takes so long to get going, in fact, that when waiting for the test page to print out you might be forgiven for assuming the printer had failed.

The BJC 620 can print on a wide variety of media, from copier paper to high-res paper, high-gloss paper and transparencies. It will even print on fabric paper, so you can use some of the children's packages such as Barbie Fashion Designer *(reviewed on page 108)*.

The drivers are equally simplistic. The interface is almost entirely graphical, right down to the choice of paper size. For colour printing you can choose from four basic modes: high speed, and three qualities; high text, high graphics and photographic. To help you out, each of these have little pictures next to them to suggest output and a clock showing proportionally how long each will take to print.

The driver software is not desperately helpful, though, when it comes to checking on the status of your print job. It will tell you how much longer the job will last and the time at which the job will be finished. It even shows you, graphically, how much of the page has been printed. What it doesn't tell you is whether the print job is still spooling to the printer, or the level of your inks. Which may not seem desperately important, but at least showing you the level of inks, graphically, gives you fair warning of when you need to start looking for some cartridges. The ink status is instead indicated on the printer body with a series of LEDs. Even so, the button doesn't tell you which ink needs to be replaced, only that you should open up the printer and take a look.

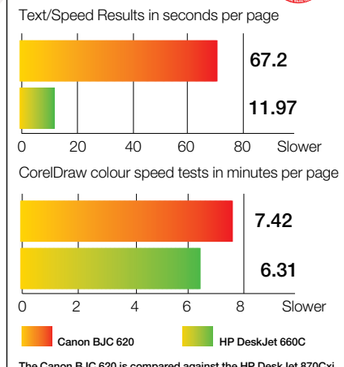
The printer cover is littered with buttons not only indicating error and power, as you might expect, but also whether you are printing on to an envelope or plain paper and whether you are using the Windows Printing System. It all seems a little excessive.

The print quality is impressive and the photographic mode does produce some stunning results but in high graphics mode there were one or two disappointing failures for a printer in this price category. It did not print the white on black hairline at 720dpi and there was a some banding on the solid colours at 360dpi.

As for print times, these are very similar to the those of the Epson Stylus 200, a much cheaper printer. Canon states in its press release that it is "the ideal colour printer for a larger office", yet the printing times we encountered in our tests suggested that this boast is a little hopeful.

Adele Dyer

Performance results



The Canon BJC 620 is compared against the HP DeskJet 870Cxi, which won the recent inkjet printer group test. Text speeds are well down on those of the HP. Even on its 'high speed' setting, the Canon was still slow on text.

PCW Details

Price RRP £399 (plus VAT)
Contact Canon 0121 680 8062
Good Points Easy-to-use drivers.
Bad Points Rather slow for the price.
Conclusion A good printer, but at the current price it needs sprucing up.
★★★

p80 ➢

Personal Computer World Recommended

Hardware

Taxan Crystalvision 650

You'll pay more for this monitor but get a good-quality screen.

Flat panel TFT displays are nothing new, but Taxan's Crystalvision 650 offers unrivalled performance and a price which, while four times more than an equivalent CRT monitor, is beginning to sound reasonable.

The 650 boasts a huge 14.5in colour TFT panel, capable of resolutions up to 1024x768 pixels at 75Hz. Bear in mind that all 14.5 inches are viewable, as oppose to 17in CRT monitors, which typically only reveal 15in to the user. So the 650 is comparable in screen size and performance to a 17in CRT, but measures 2.5in thick!

When adjusted correctly, the image is gorgeous. It's also the only panel so far to be certified as TCO-1992-compliant. Suffice it to say the 650 is Windows 95 plug and play compatible and supports VESA DPMS power saving, although it only consumes a mere 27 watts when operating. The 650 accepts the analogue output of a standard video card, where many panels in the past have required a dedicated video card, resulting in additional cost and inconvenience in fitting. The 650 has stereo loudspeakers. Fantastic, but who's going to fork out the two grand asking price?

TFT panel displays are expensive, but ideal for a number of specialist applications: typically those where small desk footprint, low electrical interference, light weight, or design are paramount. City dealing rooms need a lot of information, so a large screen but thin display is more than welcome. Military and government applications require small and light displays which won't interfere with sensitive equipment. Panel displays are perfect for these applications, along with those times when looks are vital, such as in a reception or meeting room.

Gordon Laing

PCW Details

Price RRP £2899 (plus VAT), street £2175 (plus VAT)

Contact Taxan 01344 484646

Good Points 17in performance at 2.5in thick.

Bad Points Four times more expensive than an equivalent CRT.

Conclusion Everyone wants one.

★★★★

Hardware

Snapshot Photo Scanner 1

Turn your photos into calendars, cards or pictures.

The home digital imaging revolution has already begun. Manufacturers left, right and centre are releasing digital cameras, mini printers, mini scanners, and are persuading us to use our computers to add value, so to speak, to our cupboards full of photos. Yes, today it may be just a photo of Uncle Fred, complete with satanic red-eye, but a couple of software wizards later, the eye's back to normal, while Fred has found himself starring on a home made Christmas card or calendar. The possibilities are endless.

As most photos are postcard-sized, there's no need to have a desk-consuming flatbed device. Kodak has come up with a tiny alternative, charmingly called the Snapshot Photo Scanner 1. It measures 162x57x152mm, and can handle prints up to 4x11.5in. This covers most photos, but it's a shame Kodak couldn't accommodate the wider 5x7in prints offered by most labs.

It connects to your PC's parallel port, and comes with excellent software, TWAIN driver and documentation to guide you through installation and options while in use; Windows 95 users also get the added fun of Kai's Power Goo (yes, goo) software to really muck around with.

Photos are slowly dragged through the device rather like a fax, and emerge on-screen in 24bit colour at up to 600dpi interpolated resolution. Software and hardware integrate well, but the Snapshot's quality isn't great. It's remarkably similar to a handheld scanner, which is not surprising considering the Snapshot is effectively a handheld on its back with motorised rollers. Primax's Photo Organiser is a similar solution costing £127.66 (plus VAT), which makes Kodak's look a little overpriced.

Gordon Laing

PCW Details

Price RRP £199 (plus VAT)

Contact Kodak 0800 281487

Good Points Nice idea and implementation.

Bad Points Average quality. Pricey. Four-inch image width.

Conclusion The future for many, but pricey today.

★★★

p82

Software

Adobe Acrobat 3.0 (late beta)

Adobe turns somersaults and Acrobat gets web friendly.

You know Acrobat 3.0 is different on installation. You are invited to select components depending on which web browser you prefer which means either ActiveX components or Netscape Plug-Ins (Active X — 94Kb, Netscape Plug-In — 187Kb, naturally). You will find that a typical installation takes about 40Mb of disk space and includes Acrobat Distiller, Exchange, Reader and Distiller Assistant.

Once you launch Acrobat Exchange, you'll see other web clues, notably the Go To Adobe Web Site option. Select this, up pops your web browser and in comes Adobe's own PDF page which explains Acrobat technology complete with active web links. Yes, PDF pages can now be seen directly inside browsers.

Creating PDFs is simple from existing DTP docs. Convert the page or pages into PDF format using the Distiller and then open them in Acrobat Exchange. Here you can add dynamic elements such as web links, links to other PDFs and hot spots. These can be created so that a mouse-over on the document triggers actions such as linking to a web site, linking to a data file from Word or Excel or database information. All these work both in the Acrobat Reader or, more specifically, in the web browser which turns PDF's into dynamic web documents.

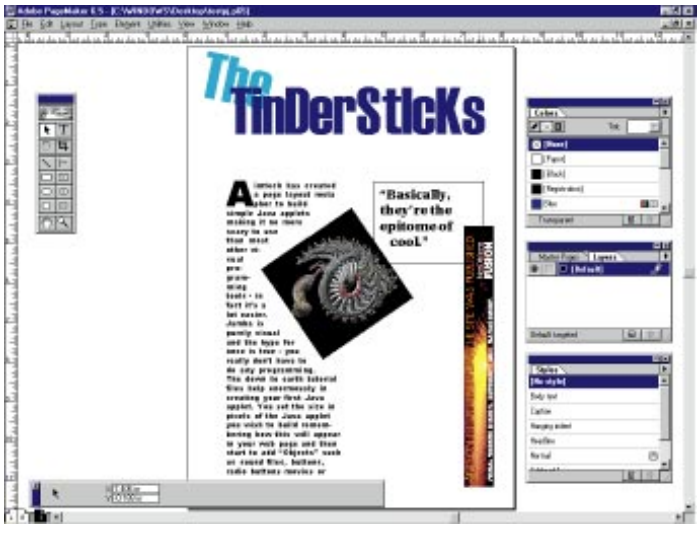
The test page compresses to 54.4Kb from 166Kb which is respectable and compares well with ShockWave and proves that Adobe has improved the compression tools in Acrobat. Due to a bug which disabled the movie facility, AVI files just wouldn't run. It was difficult to test Acrobat's new multimedia capabilities and see how well these compressed down.

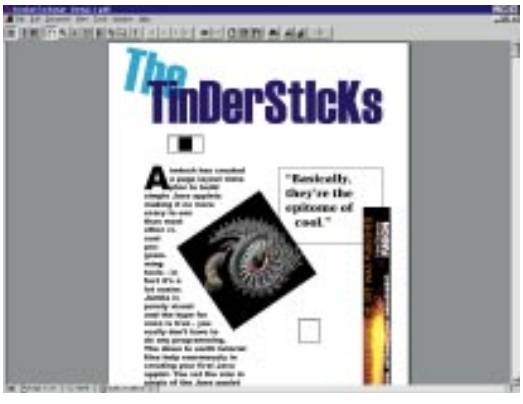
Despite this, Acrobat worked extremely well and pages converted to the web effortlessly. So well in fact that it showed up the discrepancies between the two leading browsers. Thanks to ActiveX, Internet Explorer 3.0 seamlessly loads the PDF without fuss while Navigator 3.0 chugs along collecting all its plug-ins and helpfully displays the Acrobat splash screen while it doing it. It took about 20 seconds longer to complete the task. Both display PDF files complete with the Acrobat Reader tools and menu items within the browser window, as they should. In Windows 95 new macros are automatically added to Word and Excel to create PDF files which is a neat touch.

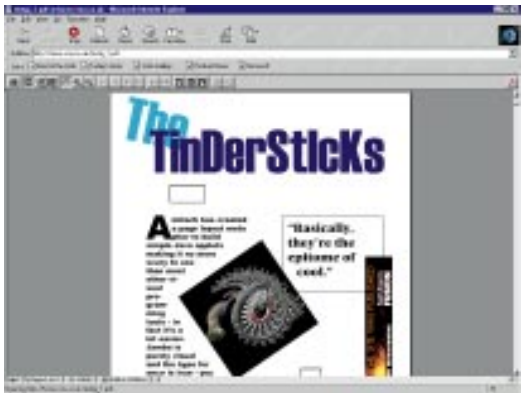
In use it is like using the Reader. The magnification of text is truly impressive and fonts and graphics look great - all images are automatically converted to JPEG.

Apart from the movie bug, Acrobat is an impressive piece of software and at last Acrobat is fulfilling its potential as an alternative to paper. This is one of Adobe's best pieces of software design in recent years.

PJ Fisher







Top Design your page in PageMaker as normal and export it as a PDF or save as an EPS to be distilled
Centre After distillation your page is now available for viewing in Acrobat Exchange
Left Store the PDF in your web server and it opens fully intact within either IE 3.0 or Netscape 3.0. Note that the full Acrobat menu is available within the browser.

PCW Details

Price about £160 (plus VAT)

Contact Adobe UK 0181 606 4000

Good Points Very sexy software which works and gives the web a new dimension.

Bad Points Only works with Netscape 3.0 and IE 3.0.

Conclusion Brilliantly-integrated tool for online publishing that in an ideal world would make Acrobat a web standard.

★★★

p84

Personal Computer World Recommended

Software

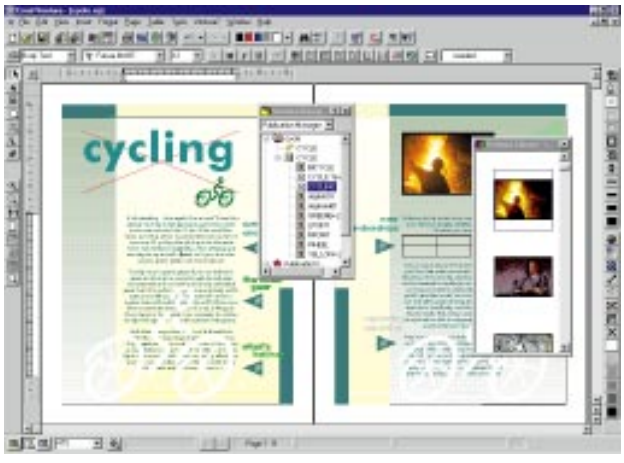
Corel Ventura 7

With an improved interface, this jam-packed version of Ventura is the best yet.

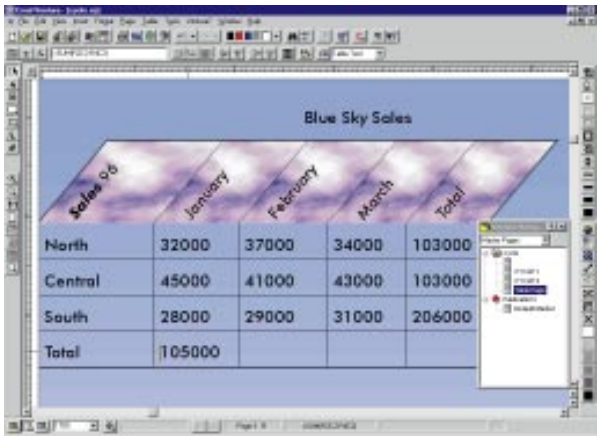
The product reviewed was at Beta 5 stage and came on a single CD-ROM. The final product will follow the Corel "pile it high" practice and contain WordPerfect, PhotoPaint, Depth (a 3D logo creator), diverse database publishing utilities, Media Manager, Script, Web Designer, a version manager, multi-lingual proofing tools, 1,000 fonts and a 30,000+ clipart and image library.

Turning to the main attraction, there have been some fairly drastic interface changes. Gone are the Corel-style roll-ups, replaced by Microsoft-style toolbars. All are completely customisable with a separate configuration manager to make wholesale changes to the interface — say between layout-intensive and long document publications. Using the product straight from the box, you get the usual file, undo/redo and proofing buttons up top, plus a few others for more esoteric purposes. As well as the normal "Print", you have buttons to output as HTML, Envoy (Corel's portable document rival to Adobe Acrobat) and Barista (a Java and ActiveX aware format that adds multiple fonts, columns and forms to web pages). There are shortcuts to import text and graphic files, and launchers for the only two palettes you are likely to have on screen most of the time. The Navigator provides a tree-like overview of the document, showing chapters, style tags and imported files. The Library can store not just text and graphics for re-use, but styles as well.

As before, the page layout tools are on the left, with zooming and navigation tools below. New toolbars include specific ones for outline attributes and Corel's wonderful assortment of bitmapped, vector, gradient and fractal fills. The main change, however, is the Property Bar. This again follows the Quark/PageMaker pattern (except that it can be docked) in offering "one-stop" formatting of the selected item — replacing many previous dialog boxes and roll-ups. It's context-sensitive, so will show font attributes when editing text, paragraph attributes when applying style tags and positional information of frames and graphic objects.



Left Ventura's new look — Property Bar, Navigator and Library
Below Fractal fills and spreadsheet formulae in Ventura tables



Ventura's frames — which can hold either text or graphics — are rather clever. You get a variety of pre-formed shapes including hearts, stars and speech bubbles, and you can tweak these further with the node-editing tools. Text will flow to fill the frame and pictures will be cropped to it. There's no longer any need to explicitly change "mode". If the pointer is over a text box, you just click and start typing. If over a graphic, click and the relevant editing tools appear. There's all sorts of "smart" writing aids, such as on-the-fly correction of common errors and a box in the Property Bar that shows the word at the cursor and gives instant access to the spelling checker or thesaurus.

Two long-awaited features are a multiple document interface — you can now open several publications and drag and drop between them — and multiple "Master" pages. The latter act as page templates, containing column guides and "furniture" such as page number and title blocks. Formerly, you could have just one left and one right master page, but if, as with *PCW*, you have various column layouts, you will need multiple masters. Other new features include "Conditional" tags to create multiple versions within the same document and the Corel Script utility to create extra features in a similar way to Quark Xtensions or PageMaker Plug-Ins.

If there's a fault with this package, it's that there's too much. It seems strange to promote Ventura as the one-stop solution for paper, electronic and web publishing and then include a competing web page designer. Similarly, if its story editor, formatting and proofing tools are adequate, why compete with WordPerfect?

Tim Nott

PCW Details

Price £695 (plus VAT)

Contact Corel 0800 973189

Good Points Vastly-improved interface, good electronic publishing support.

Bad Points Expensive, complex and rather unfocused.

Conclusion The most approachable Ventura yet.

★★★★

p87 ➢

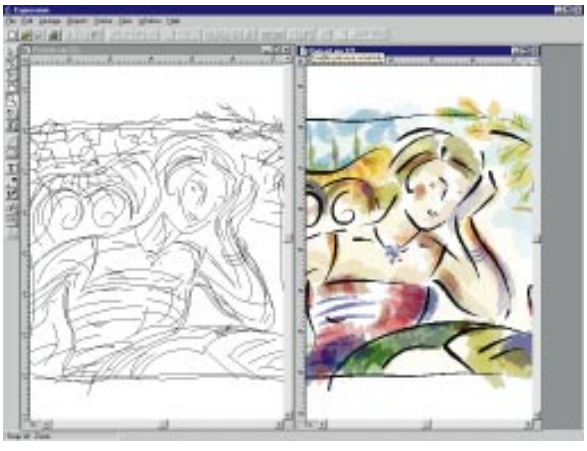
Software

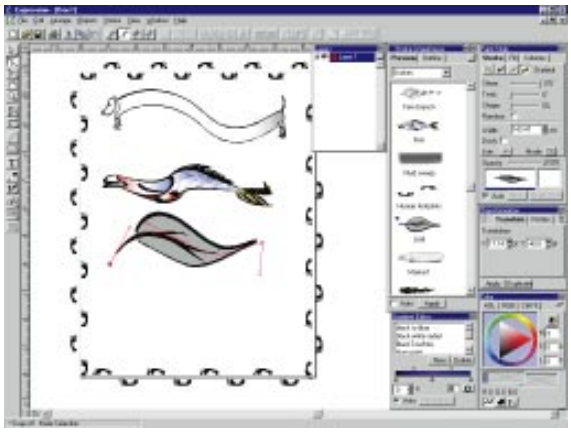
Fractal Design Expression

Another ground-breaking package from an innovative company, but will it catch on?

Fractal Design is a company well-known for taking an innovative approach with its products and Expression is no exception.

Illustration software conventionally falls into one of two camps. There are the bitmap "paint" packages like Paintshop, Photoshop and Fractal's own Painter, and "vector" packages like Adobe Illustrator, Corel Draw and Windows Draw from Micrographx. The former work on a pixel-by-pixel basis, creating and adjusting images dot-by-dot, the latter by defining straight and curved lines with mathematical formulae.





Top These two views show a typical Expression illustration in path view and preview mode.
Right Skeletal Strokes allow you to in effect "draw with drawings"

Fractal has turned the whole thing on its head by producing a "natural media" paint-style program which uses vectors, in this case PostScript paths, to represent individual brush strokes.

The Expression interface looks like any other vector package with tools for creating and editing PostScript paths. There's a range of Bézier drawing tools for producing curved lines with "handles" which extend from points along a line and allow you to change the shape and direction of a particular curve section. There are also shape object tools for drawing rectangles and ellipses, node editing tools for adding points to a curve and converting from corner to curve points. The familiar transform tools allow you to reflect, rotate, scale, skew and distort objects.

Although Expression bears striking similarities to vector draw packages in its range of tools: what you can produce with them goes way beyond the usual limits. Expression's strokes go several steps beyond the width and colour limits of ordinary vectors. The stroke warehouse provides a selection of stroke styles akin to natural media — watercolour paint, charcoal, dabs and various brush stroke styles. The width and opacity of the stroke varies across the length of the curve giving a very un-vector like look.

If Expression was merely a vector draw package with a selection of snazzy brush stroke effects, it would be nothing more than an interesting development in illustration software. What really makes the difference is what Fractal calls "Skeletal Strokes". These allow you to create a stroke style from an existing illustration. In other words, you can create a drawing of, say, a fish and use that as your line style. Any lines you draw in the fish style will bend and twist the fish to fit along the curve.

Skeletal strokes are useful in a variety of ways but two obvious ones spring to mind. If you want to distort an existing graphic, turning it into a skeletal stroke provides almost unlimited opportunity for distorting it into virtually any shape you like. Skeletal paths also give you the option of repeating, rather than stretching the graphic components and you can also set anchor points to define where the repeat begins and ends. So, if your skeletal path consisted of a train with an engine at the front followed by coaches, you could anchor the engine and set the coaches to repeat. Then, when you drew a path, the longer you made, it the more coaches you would get. This feature would be particularly useful for drawing borders or any graphic that uses repeating elements along a path.

Expression won't appeal to everybody. Those who like their paths vectored and their painting pixellated might consider it a little gimmikey. For professional illustrators, a combination of well-integrated vector and bitmap packages will provide greatest flexibility, although Expression might be relied upon for certain difficult-to-do distortions. Otherwise, if you're looking for the "natural media" style of a paint package with the control and flexibility only previously available to vector graphics, Expression won't disappoint.

Ken McMahon

PCW Details

Price £299

Contact Principal Distribution 01706 832000

Good Points Innovative use of vector format to create paint-style illustration.

Bad Points Could take getting used to. Possibly a short-lived gimmick.

Conclusion Could be for artists who haven't yet found what they are looking for.

★★★★

p88 ➢

Software

Exchequer Enterprise

Heavy-duty accounting for more than keeping tabs on your pocket money.

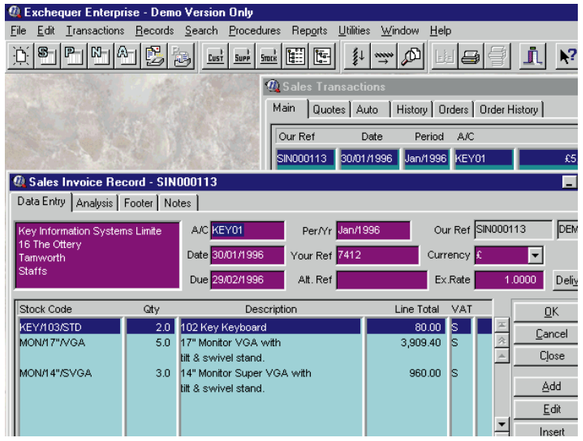
Enterprise is a heavy-duty accounting software suite aimed principally at those companies with more demanding accounting requirements. You'll only just have heard of Enterprise, because it wasn't launched until November. You might have heard of its DOS predecessor, with which it is key-compatible, although that was called Exchequer, having been marketed by SBS Financial Systems, who has changed its name too, and is now Exchequer Software. All clear? Incidentally, the DOS version was Editor's Choice in *PCW*'s last accountancy group test.

Enterprise is sold mainly through dealers with their full arsenal of demonstration and customisation facilities, but if you know what you want from the system, you can get it direct on CD-ROM. For the purpose of the review, Exchequer supplied us with a demo version, complete with tutorial but without a manual (which explains why its star rating must be provisional).

Enterprise is a full 32-bit Windows NT application which will run under Windows 95. This may not impress a market which is hugely keyboard-oriented and still seems happy with DOS. For such traditionalists, it also includes a DOS interface.

It's a modular system, with a central core of the three standard ledgers ,— Sales, Purchase and General or Nominal — together with Invoicing and a Cashbook. That will set you back a recommended £2,600 for a single user licence, rising through £6,500 for twelve users to £15,600 for forty-eight. Standalone and client/server versions are available. You can also pay slightly more for multi-currency capability (hey, you may need it for the Euro). Extra modules, starting at £500, include Stock Control, Bill of Materials, Sales and Purchase Order Processing, Costing, and a Report Writer. The company promises Job Costing and an Asset Register later. There's a non-optional support charge of ten percent With these facilities (and prices), Enterprise is thus firmly ranged against systems from Sage (Sovereign), Pegasus and Tetra.

At its simplest, Enterprise's drill-down takes you instantly from summary to detail Entrprs2.bmp Another strong Enterprise area is in its support for every kind of chart you've ever heard of, plus some you haven't



As well as its 32-bit power, Enterprise is also hoping to capture your attention with some of its additional capabilities, including drill-down investigation, open periods, and integration with Microsoft's Office. This latter gives you OLE links to Word and Excel (both v7.0), increasing the range of functions like letter writing, stock analysis and budgeting.

Drill-down is a system of recalling and examining any prior records that are linked to a particular transaction, like customer/supplier details, matching transactions (orders, payments), stock records, general ledger accounts, and department accounts. It's equally useful for analysis or fixing blame. In the ledger, you also get sub-groups presented in a tree format, graphically illustrating their interdependency. Open period accounting is well known lower down the accounting software scale where it shields non-accountants from the need to close the books. Now accountants can have it too.

Another neat Enterprise trick is the self-balancing journal, which can be used when you want to post several items to the same general ledger code. In cashbook transactions, for example, specifying the bank account as the self-balancing account for expense categories like wages, bank charges, and tax, means you need only to enter the debit lines of those transactions for the credit lines to be posted to the bank account automatically.

Enterprise is particularly strong in its support for form design. This is implemented in a separate but integrated program which lets you design your own sales invoices, purchase invoices, quotes and picking lists by sight and print them as required. Forms can consist of text (and graphics like borders, boxes, shading and colour or logos) plus any information from the accounts database, which can be text, numbers or a combination. In addition, you can generate calculated data from a wide range of formulae. There's also provision for serial or batch numbering.

James Taylor

***PCW Details**

Price £2,600 (plus VAT) single user (System & Core modules): other modules start at £500

Contact Exchequer Software 01202 298008

Good Points Easy operation (but with password control), wide range of reports, flexible drill-down investigation.

Bad Points Poor Windows help file (in Windows 95).

Conclusion An excellent addition to the pantheon of accounting greats. Enterprise offers a good range of ancillary functions and genuinely useful innovation.

★★★★ (Provisional)

Software

Micrografx Windows Draw 5

Crammed with tools, guidance and value, the only hitch is the American demo.

Micrografx doesn't waste time in getting upgrades out of the door. Windows Draw 5 follows hard on the heels of Draw 4 (see *PCW* April 1996 p213). Recent purchasers of Draw 4 needn't worry that they've missed out as, aside from a new front end and additional templates, there doesn't look to be that much new.

There's no disputing Micrografx gives you a lot for your money. In addition to Draw 5, the double CD package includes Photomagic (a better-than-average picture editing application), Instant 3D and ABC media manager, a clipart library browser.

Those new to design will find plenty of help available. Initial options include a demo, a "Learn about Windows Draw 5" tutorial and project wizards. The demo is fine if you get your laughs from cheesy voiceovers spouting line's like: "I bet Salvador Dali would've liked this distort feature". (I bet he wouldn't). The tutorial on the other hand provides genuinely useful pointers to some of the less obvious features. A particularly noteworthy one being "Block selecting" which allows you to drag select several objects which are on top of a larger background without inadvertently picking up the background. This is one of those features that you just know has been thought of by a real user, the software equivalent of keyrings that whistle when you clap, or post-it notes, or hip flasks maybe.

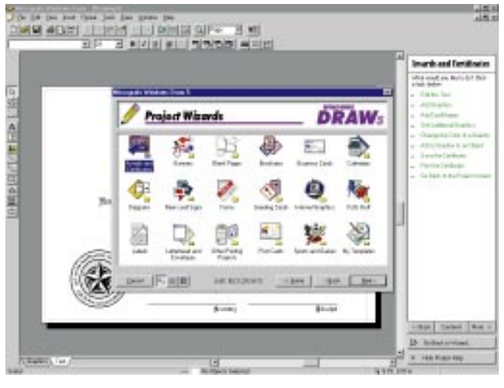
Project wizards make possible the design and production of simple stationery that doesn't look like the work of a drunken imbecile. Wizards exist for certificates, banners, brochures, business cards, calendars, diagrams, kid's stuff, forms, flyers and web pages. They take you through the design in four or five stages giving you the chance to enter personal text details and choose between half a dozen or so styles. At the end of the process what you have may not be ideal, but it's quick and will provide a good basis on which to continue. Disappointingly, the web pages don't provide any HTML authoring options, the web description is indicative of the style rather than the form. Even more so, they are transatlantic in content, the fantasy football page turned out to have a grid-iron and oval-shaped balls.

Although the interface could be a lot better, Draw 5 is full of well thought out features that ease the burden of the creative genius. The shadow panel produces instant drop shadows in any colour and direction. Coolshapes provide an instant means to a complicated graphic end be it a starburst, polygon or 3D cube. There's also a palette devoted entirely to arrows which features some of the sexiests shafts you can draw without risk of arrest.

Micrografx boasts that Windows Draw is "Office Compatible" — it looks and works like those in the MS Office suite. This is supposedly an advantage to anyone who has used Word. Sure enough, you won't have any trouble saving your documents or cutting and pasting or with any of the other mundane tasks. But in aspiring to make its graphics package work like a word processor or a spreadsheet, Micrografx has produced an interface that is uninspiring for the user.

Don't let Office compatibility put you off. The fact is that, at the price, there's nothing to touch Windows Draw 5. It is, if you like, the poor man's Corel Draw.

Ken McMahon



Wizards for everything from fake diplomas to business cards. The project help panel on the right gives advice on editing

***PCW Details**

Price Street — £44.95 (incl VAT)

Contact Micrografx 0345 089372

Good Points Excellent value. Some groovy tools. Good guidance.

Bad Points Office compatibility. Cheesy demo. Pseudo-web features.

Conclusion One of the best low-cost packages around.

★★★★

p90 ➢

Software

Lotus cc:Mail 6.0

The mail must get through! And it will, with the long-awaited upgrade to this venerable system.

This product has been around since the mid-eighties, first developed by cc:Mail (the company) and then bought out by Lotus in 1991. The last major release was in 1993, and apart from the odd minor update, cc:Mail has remained largely unchanged since then.

The new cc:Mail Release 6.0 system pack includes a rather confusing bunch of updated software for the whole family of mail products. The main module is the back-end administrative software for creating and managing the cc:Mail post office including cc:Mail Admin and cc:Mail Router for DOS and OS/2 as well as the Import/Export module. The client software for DOS, Windows 3.1 and Macintosh is also thrown in for both LAN and Mobile users. But here's the really confusing bit. Client software for Windows 95 and Windows NT is called Release 7.0 and, at the time of writing, this module is still not available, but by the time you read this review, Release 7.0 will be included as part of the Release 6.0 system pack. Hhmm following so far?

And there's more. Lotus Organizer is included in the bundle — this is the current version 2.11 which is already part of Lotus SmartSuite and integrates with cc:Mail to provide shared calendaring and group scheduling. There's also cc:Mail for web, a new package which allows you to access your mailbox from anywhere using a standard web browser.

There are several major improvements in the administrative software. The major change is one which email gurus everywhere will appreciate. You can now carry out routine administrative procedures at any time regardless of who is logged in or out of the system. That means that administrators can get their evenings and weekends back, and users will always be able to get at their mail boxes.

The second major improvement is the increased number of users supported per Post Office which is now 1000, so traffic from multiple post offices can be handled simultaneously by just one copy of cc:Mail Router. Also, CAPI 2.0 support lets you take advantage of the high speeds of ISDN.

Migrating to this new version is no small task. Any archived mail has to be unarchived before the new database format will recognise it. Also, you'll have to check the amount of disk space on your mail server before upgrading. The installation process requires roughly two and a half times the space used by your current database, and when the product is finally installed, it will take up one and a half times the space of the previous version.

On the plus side, the ability to carry out maintenance tasks while users are still logged in will make a vast improvement to the system's day to day working efficiency and ultimately makes the upgrade worth the hassle.

Eleanor Turton-Hill

PCW Details

Price £41 per user based on 100 users

Contact Lotus 01784 445808

Good Points Easier administration all round.

Bad Points Installation is not as smooth as the documentation would have you believe.

Conclusion Many users may now choose a completely different solution (intranet builders, groupware, and browsers) rather than upgrade to this version.

★★★★

p92 ➢

Software

NetObjects Fusion 1.0

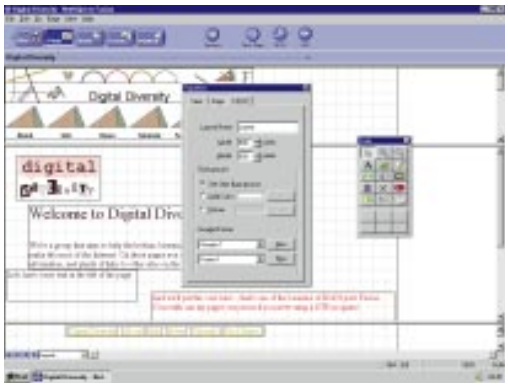
Consistent website creation the powerful way — but only if you're starting from scratch.

Designing web pages is getting easier all the time, but it's still a far cry from the sort of control that any seasoned DTP user is used to. Trying to place text at a particular place on the page is a hit-and-miss affair at best.

Until now. NetObjects Fusion is a web design system which is intended to give a degree of control to users not seen before, even in sophisticated packages like HoTMetaL and PageMill. You'd expect nothing less for a price tag of $695.

When you first create a new site, you're greeted with a blank screen on which you can create your first page, which appears as an icon. You can create additional pages, which will show up as the children of the current page. After you've added a handful, you'll end up with something that looks like a family tree, full of little page icons, each of which can be named. If you're used to the "design a page, then link it" philosophy of other web tools, this might seem strange, but it certainly helps to plan out your site.

The clever business starts when you double click on a page to open it in the editor. Banners are automatically created at the top of pages, complete with button bars if you want them, and a set of text links in a footer, instantly removing most of the tedious work of building a site. Drag a page to a different location in the tree, and all the links update automatically, so they'll point to the correct parent page, for instance. Hit "Preview" and everything will be launched into your browser.



You can place text wherever you want with Fusion, but you'll need a resolution of 1024x768 to see everything that's going on

There's a comprehensive styling facility, with a wide range of templates for those who don't want to work from scratch. You can swap between them and instantly see banners, buttons and bullets update on screen. Properties for everything are controlled via a floating palette, which is usually simple, but confusingly changes often, depending on whether you've clicked in the page body, header or footer.

There are drawing tools which you can use on the page, and Fusion will automatically create a GIF when you hit "Preview" or "Publish". Need complex layout? Just drag a text box to wherever you want it, just like in a DTP program.

All this is possible because Fusion isn't actually editing HTML as you build your site. It uses its own format and creates HTML — with extensive use of tables to control layout — when you're done. The flexibility is long overdue, but it does mean that even the "text only" version of your pages will look strange on some older browsers. There's no built-in support for frames, which means you'll have to enter the code for them automatically and, while you can import individual pages one at a time, there's no easy way to convert an existing site to a Fusion file.

Those niggles aside, this really is an amazing tool. It must be the quickest way yet to create a consistent site from scratch.

Nigel Whitfield

PCW Details

Price US$695

Contact NetObjects 001 415 943 4048

Good Points A powerful way to create a consistent site.

Bad Points Rather expensive. Use of unsupported features like frames is fiddly.

Conclusion Plenty of power. Probably the easiest way to put together a large web site yet devised.

★★★★

Software

First Aid 95 Deluxe

Do-it-yourself technical support could cut costs and the number of grey hairs on your head.

"You are in a queuing system. Please hold on. We will have an operator with you as soon as possible" — words guaranteed to make your heart sink. Some application has suddenly decided not to work and the quick call to technical support puts pounds on your phone bill. Or maybe you spend hours struggling with manuals trying to rectify the problem, usually fixing it, but causing five other problems in the process.

First Aid is one of the best-selling "technical support in a box" products. It fixes problems in several categories and provides a direct link to CyberFix's web site to update First Aid and its knowledge base of Windows applications.

It is UK-specific, which is extremely useful. "The Support Exchange" is a database of some 2000 hardware and software vendors which, in most cases, provides a mailing and email address, corporate, customer service, sales, technical support, fax and BBS phone number, CompuServe and AOL forum information, and FTP and web locations. If you click on a URL, First Aid Deluxe will launch your browser.

There are two new emergency recovery tools: RetroFix and Startup Recovery Disk. RetroFix Monitor is automatically launched when you start Windows and makes a backup of configuration files and the Windows Registry, or any file you choose, and tracks changes in them. If you don't want it to launch on startup, you can load it from First Aid 95 Deluxe Launch Control to restore configuration files when needed.

The Startup Recovery Disk is the usual sort of startup disk you should keep for those times when your computer can't access the operating system files and won't boot.

Aside from these additions, First Aid 95 Deluxe has the same features as earlier versions. Fix Applications checks supported installed Windows applications for many types of problems using the information in the CyberMedia Knowledge Base, which it regularly updates from the net, CompuServe or America Online. Unsupported applications are checked for startup problems using the information in the application's static DLL files. Windows Guardian does much the same thing, but only with 16bit applications and only when the application generates an error.

It runs checks on your multimedia setup and fixes some of the problems with audio, video, and MIDI files, CD-ROM performance and multimedia device drivers. It diagnoses problems with your computer's communications and networking capabilities, performs some minor clean-up jobs, so you can delete unwanted files and trims features you don't want from applications.

First Aid Deluxe: Fix Applications — find out what's wrong with your installed applications

Perhaps the best feature is CrashGuard which works in the background and steps in before a General Protection Fault hangs your machine. It lets you save data in open applications before rebooting, a feature which has saved me many times.

Paul Begg

PCW Details

Price £59.95 for First Aid 95 Deluxe, £34.95 for First Aid 95. First Aid 95 users can upgrade to the Deluxe version for £19.95.

Contact CyberMedia 0800 973631

Good Points Packs in a lot of useful information and tools.

Bad Points It doesn't really do enough.

Conclusion If you install and uninstall a lot of software and hardware, you'll benefit from First Aid 95. But if things usually run trouble-free, you won't get use out of it.

★★★★

Software

Multimedia encyclopaedias

There are lots of them and some are more famous than others. But how do you choose between them? Paul Begg swots up on the range of encyclopaedias available.

Encyclopaedias are one of the most hotly-contested areas of multimedia publishing and there are encyclopaedias to suit every need and every pocket, from Britannica CD 2.0 which costs £75 to Webster's Concise Interactive Encyclopaedia at £12.99.

There are advantages and disadvantages to each. The Grolier one has probably got the most solid content, but has a very strong American bias. The Hutchinson Multimedia Encyclopaedia is produced in the United Kingdom and has a British orientation, but the entries are short. Encarta bridges the gap, being based on an American encyclopaedia but having been anglicised and having had the content beefed up.

Compton's Interactive Encyclopedia

While none of the encyclopaedias are aimed specifically at children, all have been produced with children in mind, as frequent references to the National Curriculum illustrate. Most target the post-eleven age group, but Compton's is distinguished by also catering for a lower age range.The emphasis of Compton's is on fun, which begins with an introductory tour by Patrick Stewart (Jean Luc Picard from *Star Trek: The Next Generation*), and even features an astronomy game called Star Quest.

The "fun" is both good and bad. It encourages children to explore the encyclopaedia and learn in the process, but is bad because you generally turn to an encyclopaedia for information, and the fun can be diverting. This also makes the encyclopaedia less useful for school use.

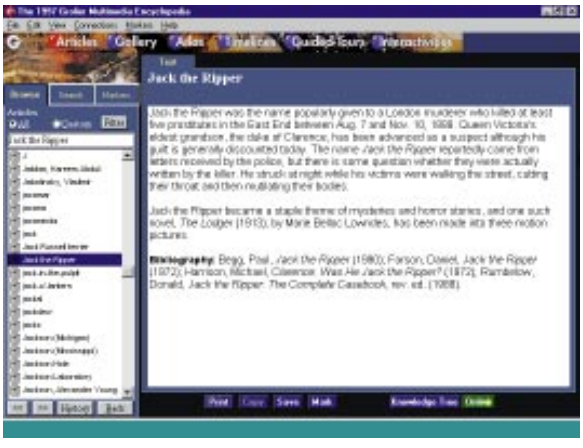
But don't think the Compton's is a slouch on content. It is fairly solid. There are 37,000 articles, more than 100 videos, animations, slide shows, and presentations, 8,000 photos and illustrations, and nearly 17 hours of sound and music. You can access timelines of both US and world events, an up-to-date interactive atlas, and a dictionary and thesaurus.

Compton's has direct links to relevant web sites. The Monthly Updater lets you download updates to existing articles and web links, and new articles. If you are on AOL you can join the Compton's NewMedia Forum and communicate with people who can may help you with your school projects and work.

Above The Encarta 97 screen is nicely laid out

Right Compton's: Birmingham UK — with a map

Below Grolier: Probably the best encyclopedia after Encarta — even if it does mention me



Encarta 97 Encyclopaedia World English Edition

Encarta is unquestionably the best of the popular encyclopaedias. Microsoft has thrown money at Encarta and not only beefed up the content, but undertaken such extensive localisation that the World English Edition is effectively produced in Britain.

To undertake the content improvement and the localisation, Microsoft turned to British publisher Websters — not to be confused with Merriam Webster, the American publishing house — which has treated Encarta as a serious publishing operation.

The localisation is excellent, as is illustrated not only by entries for events like Monmouth's Rebellion and a host of scene-setting essays, but by entries for the Goons, Tony Hancock and the Ealing movies too. Entries are linked to the National Curriculum, many articles and media elements having been selected with schools in mind. In particular, Encarta enjoys a number of broad introductory

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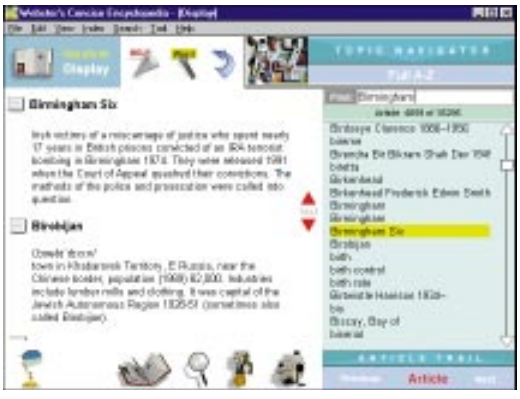
Software

articles and features relating specifically to schoolwork. There are links to educational web sites.

Particularly impressive has been Microsoft's, or rather Websters', determination to properly check out web sites, making sure that the content is solid and reliable.



Websters: It's British, has a nice interface and an unbeatable price

1987 Grolier Multimedia Encyclopaedia

The Grolier Multimedia Encyclopaedia is the best alternative to Encarta and, in some ways, a superior product. It is slightly bigger, the entries are solid and clearly written, and there is invariably a bibliography of further reading and guidance to associated entries. The main screen is neat, tidy and has access to all the features of the encyclopaedia.

The downside is its American bias. Even the bibliographies cause problems when the suggested books are American (because they may not be available in the UK). On the other hand, you will find entries for people like Tony Blair and King Arthur and for historic periods like the Tudor dynasty.

Like other encyclopaedias, Grolier has online access, but it is limited to approximately one third of the articles. These have links to related internet sites or Forums on CompuServe.

Hutchinson Multimedia Encyclopaedia 1997

From the British company Attica, the Hutchinson Multimedia Encyclopaedia 1997 has the benefit of being produced in Britain — it is still the only multimedia encyclopaedia of British origin. It also supports the UK National Curriculum but its claim to being British produced carries less weight in the light of Encarta's localisation.

New to the 1997 version are internet links, which let you bring the encyclopaedia up to date and access over five hundred recommended web sites.

In addition to the encyclopaedia itself, which has more than 40,000 articles, thirty new videos and four and a half thousand photographs and illustrations, there is a dictionary of difficult words, a world atlas, a quiz, and sets of questions specifically aligned to the National Curriculum.

The interface has been slightly redesigned and performance has been improved, but the content still fails to satisfy. The Hutchinson is more akin to a concise dictionary. But let this not be a serious criticism, for there are times when all you want is a handy and quick reference.

Hutchinson's: here you can hear Neville Chamberlain speak

Websters Concise Interactive Encyclopaedia

The Webster's Concise Interactive Encyclopaedia costs only £12.99 (incl VAT)! There's a catch, but it is one with which you might feel able to live. It is in fact the 1994 edition of the Hutchinson Multimedia Encyclopaedia. So, if you can live with an encyclopaedia that isn't bang up to date, then the Webster's must be the multimedia bargain of the year.

It includes 34,000 articles, 30 minutes of video, 150 audio clips, a Timeline, and a World Atlas. There's no access to online resources, and the entries are brief to the point of being terse, which limits its use. It has a pleasant interface, is relatively easy to use, and was compiled in the UK with a UK bias.

Conclusion

The encyclopaedia of choice is Encarta 97 World English Edition. Microsoft has chosen wisely in Websters as its content provider: it ties in well with the needs of the classroom and the requirements of the National Curriculum.

The alternative choice, despite the American bias, is the Grolier Multimedia Encyclopaedia. However, the Webster's Concise Interactive Encyclopaedia is our second choice. It has defects, notably not being up to date, and it isn't an alternative to Encarta or Grolier. However, not every home (or school) can afford £50 for an encyclopaedia, so when price is a consideration, the Webster's is a bargain.

•PCW Details

Comptons Interactive Encyclopaedia
Price £39.99
Contact The Learning Company (formerly Softkey) 0181 246 4000
Good Points Aimed at younger children.
Bad Points American content.
Conclusion It could and maybe should be a front runner, but isn't.

Encarta 1997 World English Edition
Price £49.99
Contact Microsoft 01734 270001
Good Points Localised, good content, approved online recommendations.
Bad Points Nothing really. Encarta just gets better and better.
Conclusion Buy it.

Grolier Multimedia Encyclopaedia
Price £49.99
Contact Grolier Interactive 01865 264 800
Good Points Good, solid content.
Bad Points Heavy American bias.
Conclusion Needs localisation, but still your best alternative.

Hutchinson Multimedia Encyclopaedia 1977
Price £39.99
Contact Attica 01908 570113
Good Points British, linked to the National Curriculum.
Bad Points The entries brief to the point of being terse.
Conclusion It needs a price drop to compete.

Webster's Concise Interactive Encyclopaedia
Price £12.99
Contact The Learning Company (formerly Softkey) 0181 246 4000
Good Points British, concise, and at a superb price.
Bad Points Out of date, no internet links.
Conclusion At £12.99, this is a superb bargain.

Britannica CD 2.0
Price £755 (approx.)
Contact Encyclopaedia Britannica International 0181 669 4355
Good Points Probably the best encyclopaedia, though some of the articles are heavy reading.
Bad Points Very expensive.
Conclusion Not reviewed here as it stands in an expensive league of its own. You can access it online at www.eb.com for an annual fee of £112.50.

Software

Steven Spielberg's Director's Chair

"It's a wrap!" Grab your clapperboard and megaphone and get down to the set. With Steven Spielberg as your mentor, you can't fail to produce a box office smash.

Steven Spielberg is on hand to dispense good advice, and his PA will show you how to do the more technical stuff like using the editing desk

I defy any film aficionado not to have harboured a secret desire to get out of their cinema seat and into the director's chair. This CD panders to those ambitions: sets us loose with thousands of fictional dollars, some of the best cast and crew in the world, and tells us to go make a movie.

Steven Spielberg more than just lends his name to this project. He appears frequently, popping up on video to offer help and advice and to explain the whole confusing business of movie directing, from writing the script to directing the actors, adding sound effects and music, to premiering the final film.

You are given a basic plot synopsis — a prisoner is on death row after being falsely accused of murdering his rich employer. His girlfriend tries to find the evidence needed to free him and to nail the real perpetrators. You have some great Hollywood names to help you out: Quentin Tarantino plays the prisoner, Jennifer Aniston, from the TV show "Friends", is his girlfriend, while magicians Penn and Teller also get caught up in the action.

The first step is to go off and write the script. To help you, Ted and Terry appear and gleefully tell you they have written the script for Aladdin. You are offered the chance to collaborate with the writers or to let them write the script themselves. You cannot just type in your own script, as Tarantino is not on hand to act whatever you write. All you can really do is to pick and choose from the footage available, guide the writers' hands, reject certain versions and opt for something more along the lines of how you see the story developing. You have limited choice the first time you make the movie, but after that you get more chance to pick your scenes.

You then go off to shoot the film. When you first start, you are only allowed to do a take from the master shot — that is, the wide view of the whole scene. As you progress and gain experience, you are let loose on close-ups and different angles.

However, you still have problems to deal with — wardrobe haven't got the costumes ready, the hairdresser is still at work on your stars, and the lighting guy is telling you it will take him another hour to rig up the right effects. Also, the studio is hassling you about budget and schedules, so you have to be on the ball and ready to make tough decisions.

Having put together your masterpiece, you have to edit it and add sound effects and music. This is probably the best part of the disk: it's where you get to make or break your film, and where you have the most control over the finished product. If you are unhappy about the way a scene has been written, this is where you can put it right by chopping it about to make something new. And, of course, adding the right music can turn your effort from a raw piece of footage into a real film.

Finally, you process the film and premier the movie. This is where you will need not only nerves of steel, but also a large amount of free hard disk space — up to 28Mb of free space, in fact, as the relevant video clips are read off the CD, onto your hard disk, and the various sound tracks added. Add this to the 12Mb of free space needed to install the application, and you are up to a heavy toll on your hard disk. However, the other requirements are not out of the ordinary for a CD-ROM — a DX2/66, 8Mb of RAM and a double-speed CD-ROM drive.

Adele Dyer

PCW Details

Steven Spielberg's Director's Chair

Price £49.99

Contact Random House 0171 973 9000

Good Points A great way to learn the art of film-making.

Bad Points You will need a lot of free disk space.

Conclusion Utterly absorbing.

★★★★★

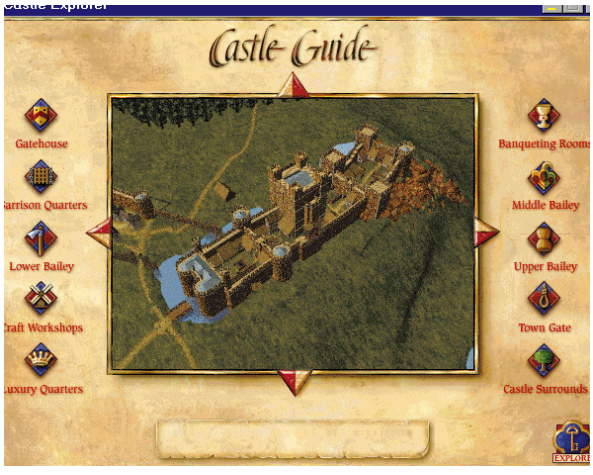
Software

DK Castle Explorer

Lower the drawbridge or, if you can discover where it is, take the secret tunnel.

Ever wondered what it was like to live in a 14th century castle? If so, Castle Explorer is the answer to all your questions. You can enter the castle as a page and find your way around, looking at whatever catches your eye. Or, if you prefer, you can go in as a spy, disguised either as a maid or a knight in shining armour, and hunt for the Baron's escape tunnel. Both are equally entertaining. The animation is detailed and the sound effects realistic. You have a chance to see the characters in person, as Castle Explorer is one of the first CD-ROMs from Dorling Kindersley to feature video clips of the characters.

Scrolling around the castle and learning things for yourself is probably the best way to approach this CD. When you click on a particular scene in the building, a description about it appears on the screen. These are taken from relevant pages in six books about castle life (also included on the CD-ROM) and they are generally a good read. You can even click on stonework to dissolve it or lift sections of the roof to examine the rooms below. On the whole this is a jam-packed CD, full of interesting information.



The castle has many interesting areas to visit

Etelka Clark

PCW Details

Price £29.99
Contact DK Multimedia 0171 753 3488
Good Points The effects are outstanding.
Bad Points Being a spy proves to be a bit confusing.
Conclusion You won't be disappointed.
★★★★

Barbie Fashion Designer

What should Barbie wear on her "dream date" with Ken? You can help her decide.

There is a huge market surrounding Barbie. Not only can you have the dolls themselves and clothes to dress them in, but a whole load of paraphernalia to go with them, including houses, furniture, cars, sports equipment and, of course, a ready-made boyfriend, Ken.

Mattel, maker of Barbie, has come up with a series of CD-ROMs based on the doll's activities. The idea is to interest girls in computers, as they have traditionally left learning about PCs to their brothers.

The CD will appeal to any small girl that likes to play dressing up. It contains a whole wardrobe of clothes for Barbie that can be mixed and matched for any occasion, whether it be a "dream date" (as the voiceover puts it) with Ken, a day in the office or a wedding gown. You can add patterns to the basic clothes and colour them in. The real fun starts as Barbie models the clothes on the catwalk.

Finally, when you have designed Barbie's essential wardrobe for the season, you can actually make the clothes by printing them out on special fabric paper (supplied with the CD) and fixing the seams with little self-adhesive tabs.

Not many of the activities have anything to do with education, but then, neither does the original airhead herself, Barbie. As the idea is simply to get girls using a PC, I suppose this could have some merit. Otherwise, it is simply a bit of harmless froth. Now who does that remind you of?

Getting Barbie ready for her big day

Adele Dyer

PCW Details

Price £34.99
Contact JM Interactive 01703 650759
Good Points Mindless fun.
Bad Points Draws you into Barbie's politically suspect world.
Conclusion Little girls will probably love it.
★★★

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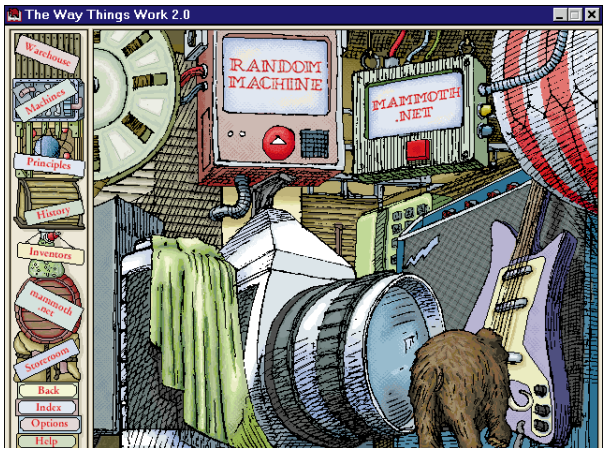
Software

The Way Things Work 2.0

Video, animations, clear explanations and the return of the woolly mammoth.



The Way Things Work was one of Dorling Kindersley's (DK) best known and earliest CDs. DK has now revamped the product, to compete head-on with some of the better children's CDs which have since come on to the market, and the work the company has put into the venture really shows. The entire presentation is drawn in cartoon style, with plenty of animations of how things work, as well as DK's woolly mammoth — a familiar character from the earlier version. The author even makes a personal appearance to explain things: he appears in a video which is cleverly integrated into the cartoon background, so as he walks around the screen he will disappear into doorways and behind buildings and reappear on the other side. Woolly mammoth, meanwhile, pops up with equal regularity, with lots of tiny snatches of animation to amuse you, or in little stories to illustrate certain principles. As always, it is the explanations themselves which are by far the strongest part of this product. Everything is explained, from hot air balloons to pianos, to microwave ovens. There are plenty of

An interesting and entertaining way to learn

diagrams and textual explanations added to the animations; although the latter are voiced with American accents, they are particularly good at showing, for example, exactly how the effect of one action can produce another, and how things work in practice. The textual explanations are well-linked to others, so if you do not thoroughly understand something, there is no need to trawl through indexes or glossaries to find what you are looking for.

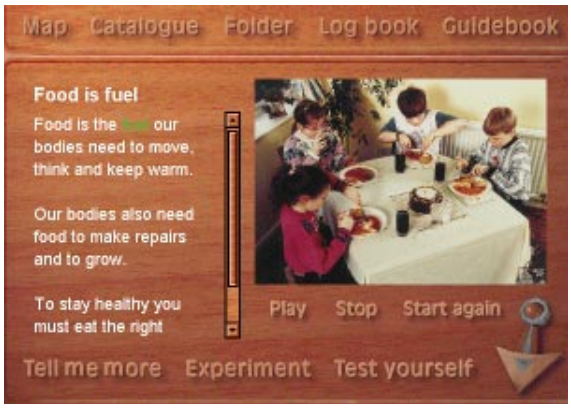
Adele Dyer

PCW Details

Price £39.99
Contact Dorling Kindersley 0171 753 3488
Good Points Great animations. Faultless explanations.
Bad Points The American accents are offputting.
Conclusion A fascinating CD.
★★★★★

YITM Science Explorer

Educational experiments, games and quizzes to do at school.



Although Science Explorer is billed as a virtual museum through which children can walk and learn as they go, this is a little misleading as to the real contents of the disk. The virtual museum does feature in it but only in so far as you can view the exhibits from a distance: you cannot approach them for closer inspection, and if you click on them for more information they remain static. The actual information on the CD is tucked away in a far less interactive section, which is almost entirely menu-driven. The easiest way to get at anything you want to know about is via the catalogue, which is simply a list of all the general headings on the CD.

The interface is not excitingly designed, neither is it particularly intuitive to use. A menu-driven system may be better at teaching children how to use traditional software but the interface is not typical to Windows, so this point is somewhat lost.

Food for thought, but it could be more filling

Once you enter, the information is good as far as it goes but is limited. Compared with, say, The Way Things Work *(above)*, the information here is desperately simplistic and rather patronising.

The interesting sections in this product are the little experiments, games and quizzes it offers. These are great fun and make the whole thing worthwhile.

Adele Dyer

PCW Details

Price £34.99
Contact YITM 0113 246 1528
Good Points Lots of experiments and games.
Bad Points Rather unimaginative.
Conclusion Behind its time.
★★

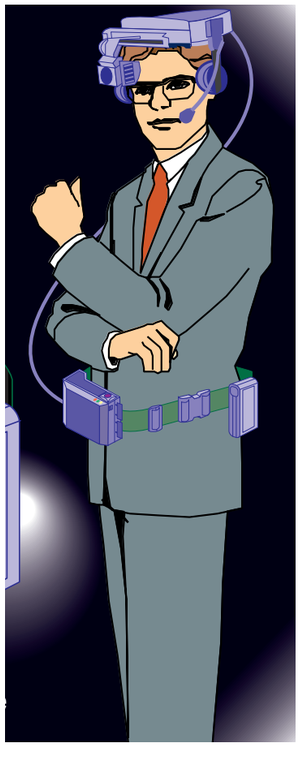
Dress code

Imagine the day when your mind-operated PC goes everywhere with you as an item of clothing… it may be sooner than you think. George Cole reports.

When the first carriage clocks appeared, few people imagined that we would ever walk around with one strapped to our body. Yet today, the wrist-watch is a part of everyday life. As computer technology spawns smaller, more powerful and more sophisticated devices, have you ever wondered whether we will soon be wearing our computers rather than putting them on a desktop? That day may be closer than you imagine. Wearable computers have attracted much attention in recent years, with various organisations racing to develop the computer you put on before leaving your home or office.

The Massachusetts Institute of Technology (MIT) Media Lab says the potential market for the wearable PC is vast. There is a wide range of people who would find such a device useful: from the disabled (for communication or accessing information), to stock brokers (24-hour stock quotes and online trading), estate agents, commuters (reading online newspapers), rural doctors… the list seems almost endless.

Many people require access to data while on the road and although a notebook PC can often fulfil this requirement, there are times when hands-free operation would be very useful. Wearable computers could be used for standard applications such as word processing, but many could also be networked or connected to the net using cable, infra-red, wireless or satellite links.



Today, the typical wearable computer consists of a belt-mounted CPU and head-mounted display. A handful of companies have launched wearable computers aimed at industrial and military markets. The Mobile Assistant, by Xybernaut, is a typical example of the state of wearable computer technology today. It uses a head-mounted display with a computer and battery pack worn on a belt. It is designed for hands-free operation and can be voice-controlled.

Xybernaut was formed in 1990 (then known as Computer Products and Services, CPSI) and its main work involved creating electronic manuals for military, intelligence and government agencies. The company noticed how maintenance technicians tended to operate in pairs: one working on machinery while the second held a technical manual and shouted out instructions. Xybernaut believed it would be more flexible if one operator could have all the technical information to hand.

Notebook PCs were considered, yet some repair tasks involve using two hands and often there is simply no space for a computer. Xybernaut spent six years and hundreds of thousands of dollars developing the Mobile Assistant. The device has a lightweight (226g) head-mounted display with a small LCD eye-piece, an earphone and a microphone. The LCD screen display is mono but later versions will offer colour. Special optics make the eye-piece image appear to float in front of the screen and, according to Xybernaut, the display size is roughly equivalent to that on a 15in desktop monitor.

MIT lets the shoes do the talking

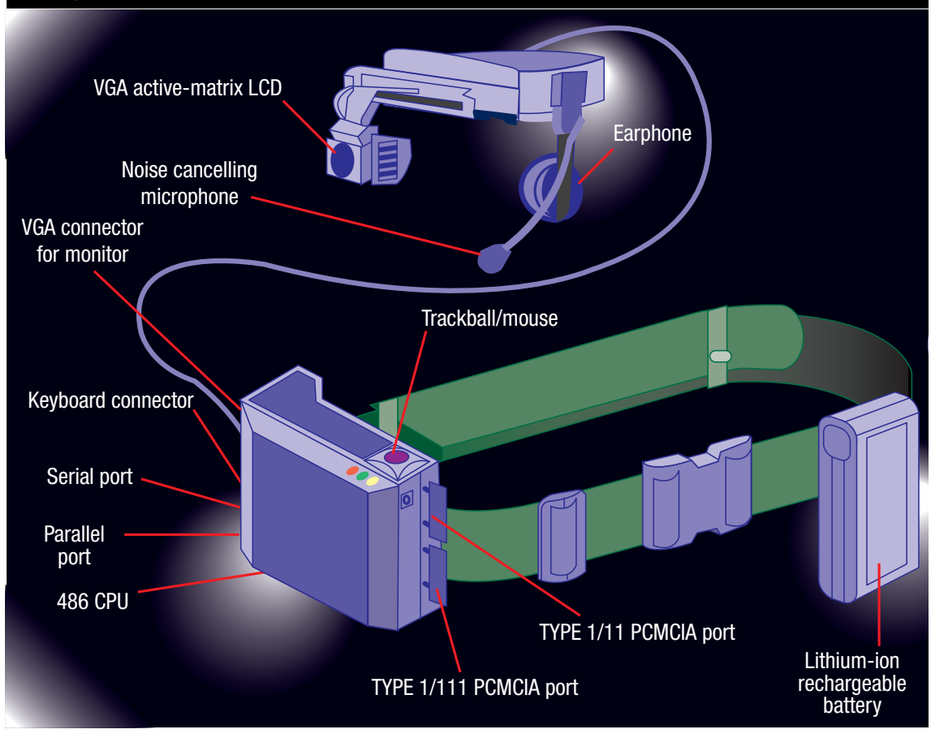
The Media Lab at the Massachusetts Institute of Technology (MIT) has developed what some view as the ultimate wearable PC: the computer that sits inside a running shoe. The shoe computer (sponsored by Reebok) may sound like something out of a comedy sketch, but it isn't. The prototype computer fits inside a shoe like an insole and is powered by human and battery power.

The act of walking generates about 60W of power (enough to power a light bulb), mostly in the form of heat and mechanical energy. MIT believes that up to 17W of this energy could be used to power the shoe computer. The researchers also believe that by shaking hands, users could exchange information between two shoe computers: the hands could complete an electrical circuit, allowing signals to be transferred between both computers.

The Media Lab is involved, too, in many other aspects connected with wearable computers. For example, it is investigating various types of user interface, display technologies, operating software, and future applications such as VR. It is also adapting its face recognition system Photobook for wearables. The system enables 8,000 facial images to be scanned within one second and could be used by the police, reporters, politicians and the visually disabled (with an audio interface).

The Media Lab's web site on wearable computers is an excellent start for anyone interested in the work taking place. You'll find it at www.media.mit.edu/projects/wearable/

The typical, wearable PC



■ Head-mounted display
Typically, a 1in active matrix LCD screen offering VGA graphics, which may be mono or colour. The LCD screen sits several inches in front of one eye, allowing the user to continue to see the outside world, thus preventing them from becoming disorientated. Special optics are used to create the illusion of a much larger image (typically 15in), being viewed some 18in in front of the eye. Some units include a head-mounted camera for teleconferencing or tele-medicine. Computers operated by voice recognition software often use a noise-cancelling microphone: noise -cancelling signals are used to improve the accuracy of the voice recognition software. As the head-mounted unit is lightweight (about 250g), it can be comfortably worn for hours on end.

■ The CPU Unit
About the size of a paperback book and weighing a little over 1Kg, the CPU is attached to a belt worn around the waist. Most wearables use 486 or Pentium processors and offer between 4Mb and 8Mb of RAM (usually expandable) and a 500-1,000Mb hard drive. The computer is pre-loaded with Windows 3.1, or 95, as well as speech recognition software.

The CPU has input/output sockets for standard serial, parallel and keyboard peripherals, plus barcode readers, mouse, CD-ROM drive, printer etc. PC Card slots enable many features (e.g. RF communications and Global Positioning Systems) to be added to the wearable PC.

■ Battery Pack
Attached to a belt, the battery may be a rechargeable Nickel-Metal Hydride (providing about two to three and a half hours' use), or Lithium-Ion (about four to four and a half hours' use).

The PC base unit is the size of a paperback book, weighs 1.25Kg and is powered by a lightweight, rechargeable lithium-ion battery, which gives several hours use. The Mobile Assistant is rugged enough to withstand a fall of about one metre. In the first generation Mobile Assistant, the PC used a 486 chip, 4Mb of RAM and a 340Mb hard disk. It also came loaded with MS-DOS or Windows operating software and speech recognition software. The base unit had connections for a keyboard (full-size or wrist-mounted), a printer and CD-ROM drive, plus PC Card slots.

The Mobile Assistant is not cheap: the first generation model costs between $10,000-12,000, the second generation version costs around $6,000.

In a test, two army repair groups were each given 12 tanks to fix. One group used a Mobile Assistant and a control group used technical manuals. The groups were allocated the same amount of time. At the end of the test, the Mobile Assistant group had repaired all its tanks, while the control group had fixed none. And when the control group was given the Mobile Assistant software to use it, too, repaired all its tanks.

In another test, a utility company discovered that the time taken to diagnose and repair a gas burner was reduced from three hours to only 15 minutes in one instance, when using a Mobile Assistant. The US army is

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If you want to get a head…

Looking to the future, some foresee a time when wearable computers will be linked directly to the brain. The idea is that electrodes could be implanted into various parts of the brain (such as the visual cortex, which is responsible for sight). So-called neural interfaces are not science fiction: a number of deaf people already use cochlear implants (electrodes placed in the inner ear) to restore some of their hearing. But at present, our knowledge of brain function is so small it will take many years before we can plug a wearable PC into the brain.

Another possibility is thought control. This is not as fanciful as it seems. At the department of medical informatics at the Graz University of Technology in Austria, Professor Gert Pfurtscheller is leading a team of researchers whose work could ultimately result in thought-controlled devices. He is concentrating on a part of the brain known as the motor cortex, which is responsible for movement. Whenever we think about making any movement, it sets off a burst of electrical activity in the motor cortex. What makes the notion of thought-controlled systems a distinct possibility is that the motor cortex produces control signals whenever we think about *making* a movement but do not actually carry it out. The brain signal information could be fed to a computer, analysed and the resulting command sent to an electronic switch. Some Japanese companies, including NEC and Matsushita, have also conducted research into thought-controlled devices. But thought-controlled wearable PCs are still a long way off.

currently testing the unit for repairing AH-64A Apache helicopters.

A stitch in time…

A most appealing feature of the device is the ability to use multimedia documents with sound, text, graphics and video, almost anywhere *and* in a hands-free environment. Although the creation of voice-controlled multimedia programs can be expensive and difficult, a development by UK company, Microcosm, should improve things.

The Microcosm for Windows software allows software developers to electronically "stitch together" all types of media and create links between them. The traditional methods of creating hypermedia links often involves altering the media so that they can be joined together. All this creates extra work and often degrades the media in the process. Xybernaut has licensed Microcosm for Windows, for program development: "One of the things it will enable us to do is attach numerical names to different media. For example, at the moment if you want to call up a page on, say, a pneumatic lift assembly, you have to use the complete word. Soon, you'll be able to simply ask for 'number three' or whatever," says Xybernaut spokesman, Chris Chinnock.

Several other US companies have launched wearable computers, though none cost less than $5,000 and all are aimed at specialist or niche markets rather than mass consumers. InterVision's Systems Six uses a head-set display and a PC which clips on to your waist. The computer has a 486 processor and weighs about 1Kg.

Symbol Technology has developed the WS 1000 computer scanner. The user wears a small ring scanner, weighing 48g. This is connected to a wrist PC that weighs 270g. It is designed for warehouse and distribution staff and allows them to scan goods by running the ring across the item. The data is passed to the wrist PC, which in turn transmits the data via a radio link to the company's main computer database.

Rockwell's Trekker Mobile Information System costs about $1,300 and weighs less than 1.5Kg. It's a Windows-based machine with a 486 processor, 540 Mb hard drive, up to 16Mb of RAM, two PC Card slots and ports for an optional keyboard as well as serial and parallel peripherals. The unit is attached to a VGA head-mounted display, consisting of a 2.54cm² eye-piece, which is worn on a head-band. The computer can be controlled by voice recognition technology or a mouse, mounted on the PC and thumb-operated.

Much of the work involved with wearable computers is in designing a suitable interface. Voice recognition technology is favoured by many companies because it keeps the hands free. But there are problems. Voice recognition systems require lots of processing power which in turn reduce battery life. The systems also need to be trained to recognise the speaker's voice, which can take some time. There's the question of privacy, too, and the fact that using a voice recognition system within a group of people would be as conspicuous as using a mobile phone (and probably just as annoying).

Handwriting recognition systems are not favoured as they require the use of an electronic pen or stylus and are thus unsuitable for hands-free operation.

Even though keyboards can't be used for hands-free working, they do have their supporters. Miniature keyboards that can be strapped to a wrist are a possibility. The wearable PC sounds attractive, but is still expensive. Chinnock admits that wearable computers are: "Not a panacea for all. In some situations you'll set up a laptop, while in others you'll find it better to use a wearable PC. People will only buy something if they can justify the costs." Even so, many are wondering how long it will be before wearable computers become as ubiquitous as the wristwatch, pager and mobile phone. ■

•PCW Contacts

MIT www.media.mit.edu/projects/wearable/
Symbol www.symbol.com
Xybernaut www.xybernaut.com
InterVision www.intervisionsystems.com/
Rockwell www.cacd.rockwell.com

Group Test: CAD software

Graphic detail

Closer to technical drawing than illustration, CAD software offers a high degree of accuracy without the excesses of art packages. The choice is bewildering — Tim Nott helps you simplify it.

CAD software constitutes some of the most complex applications available for the PC, and, in terms of choice, some of the most bewildering, with prices varying from under £100 to over £3,000. At its simplest, CAD is like illustration software in that objects are stored as vectors — like a blue circle, centre xy or radius r. Although CAD lacks the artistic baggage of packages such as CorelDraw, it offers a much higher degree of accuracy. Most newcomers to CAD will have experience in technical drawing, and the release from sheer drudgery is phenomenal. Features such as symbols, arrays and offsets *(see page 141)* make short work of repetitive tasks. Trimming, filleting and chamfering obviate much drawing and erasing of construction lines. Associative dimensioning creates all those little arrows and numbers automatically.

So what do you look for in a CAD package? It depends very much on what you want to draw. For highly complex and specialised tasks, customisation and automation is a must. This can vary from simple macros to full-blown third-party developer add-ons — open architecture are the key words here. Furthermore, a major building or civil engineering project can outlast many generations of software upgrades, so the confidence that support and development will still be around in years to come is important.

2D or 3D? Again, it depends what you're drawing. The advantages of 3D modelling is that you can view — and work on — a drawing from any angle. This makes it easier to deal with potentially problematic things such as ducting layouts. You can also generate rendered views that will impress your clients. On the other hand, especially for routine jobs, it involves a lot more work and a far longer learning curve. The good news is that serious 3D is getting cheaper. There are three new products in the £150-£700 range reviewed here.

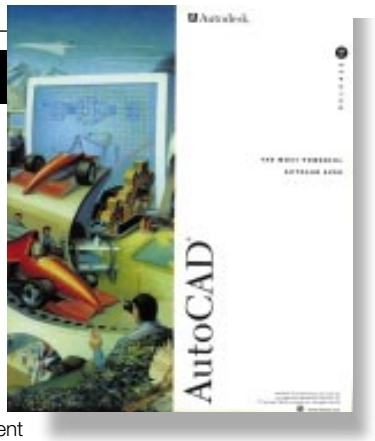
At any level, what makes a CAD application good is the interface. How easy, how quick is it to place a point exactly on another, or tap in precise numeric co-ordinates? This is the bottom line of CAD work, and a mouse click or keystroke saved per command can add up to hours over a day's work.

p119 ➢

CAD Contents

Illustration: MARK HUDSON

AutoCAD 13c4



The undisputed world leader, AutoCAD has been around for sixteen years. The c4 suffix denotes a full 32-bit upgrade from Release 13, which runs on Windows 3.1 with 32s extensions, Windows 95 and Windows NT. A DOS version is also included on the CD, and the full installation takes up 70Mb. The first attempts at dragging AutoCAD into the Windows environment were not an unqualified success, with version 12 cramming 36 buttons into one big, messy, floating toolbox. Release 13 smartened things up considerably, with multiple configurable floating palettes, and c4 takes this into the 32-bit world of long filenames and other Windows 95 comforts.

As with the earliest versions of AutoCAD, the heart of the matter is a command-line interface which works in parallel with the menu and button commands. You can still carry out practically any command without touching the mouse or digitiser. Type "L <return> 2,3 <return> 4,5 <return>" and you'll draw a line between those two Cartesian points. Add a third co-ordinate and you'll get a line in three dimensions. Put an "@" before the second set of co-ordinates and the point will be placed relative to the first point rather than absolute to the drawing. Although this command-line interface may seem rather retrospective, it does have certain advantages, the most compelling of which is that the keyboard is always "live": you can mix and match with the menus, buttons and keyboard without having to focus on an input box to type in numeric values. By default, the command-line window, which also serves as a prompter, occupies three lines at the bottom of the screen, but you can enlarge it, or scroll back to see a history of commands.

Although not even its best friends would call AutoCAD easy to learn, the interface improvements over release 12 have brought it a long way, with Tooltips, hint lines and context-sensitive help. There's also a series of online tutorials ranging from the basics of 2D drawing to more complex operations such as revolving a 2D profile to create a solid. In other respects, it's remarkably lacking in features that Windows users take for granted, such as the ability to load more than one drawing at a time. Most budget applications can manage the Windows MDI (Multiple Document Interface), but with AutoCAD you need to run multiple instances of the program.

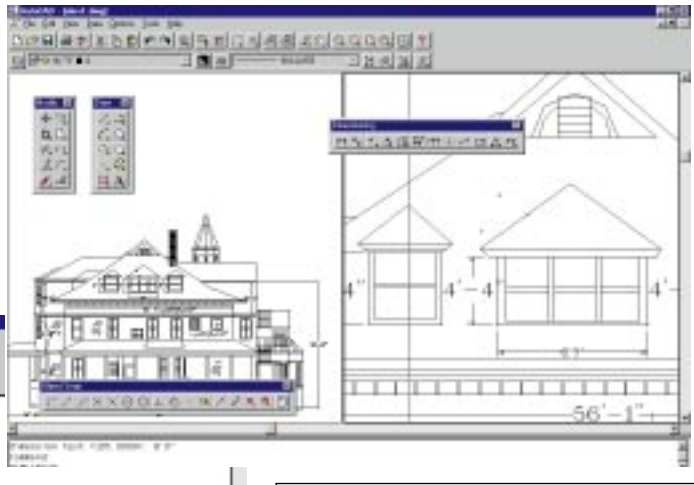
Certain activities, such as setting up perspective views in the non-standard multiple viewports, are still awkward and time consuming. However, this disregard for Windows conventions comes into its own in "Paper Space". The idea of this is that you create a drawing sheet which is permanently in top view, hence titles and notes stay flat on the page. In this sheet you can create custom viewports, each showing the model from a different angle or zoom level, and plot the result as a single drawing. You can also slice through a model to generate a cross-sectional view for inclusion on a plotted drawing.

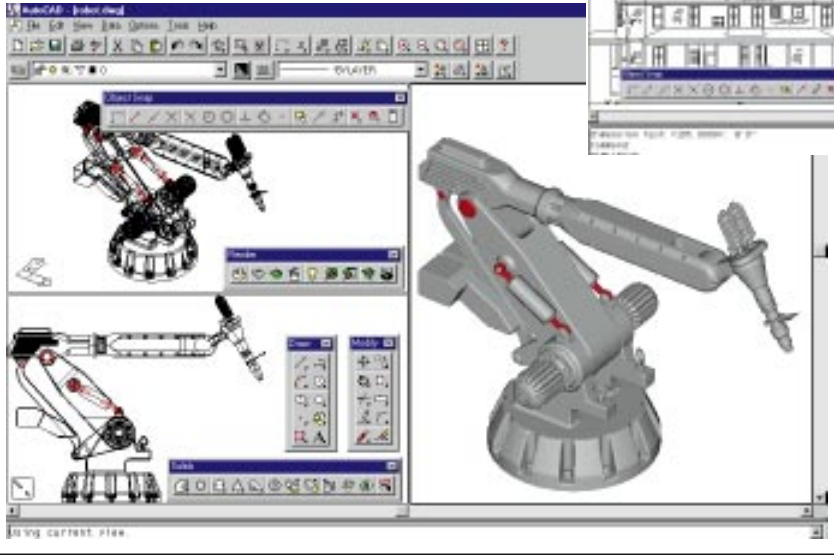
The 3D facilities are excellent, with the basic primitives such as blocks, spheres, cones and cylinders complemented by more esoteric options such as defining a curved surface from a series of arcs — e.g. a car body panel, or "sweeping" a profile along a complex path — e.g. a ducting or pipework layout. There's a full set of Boolean operations and commands to fillet and slice 3D edges or objects. There's built-in rendering, with a rather meagre library of materials, although the results are of a good quality. If you want more, you'll need AutoVision Release 2c4, a photorealistic rendering and animation software package designed specifically for Release 13. Although it's included on the CD-ROM, you'll need to pay another £495 for the authorisation code to unlock it.

Heavy-duty CAD is used in fields as diverse as printed circuit design and civil engineering, and users' requirements vary wildly, which is where AutoCAD's open architecture comes in. Automated and custom solutions can be added on at all levels, starting with simple macro-style scripts of commands and going on through the AutoLisp programming language to bespoke applications written in C++, Visual Basic or the object-based AutoCAD Runtime Extensions (ARX). Over 4,000 add-ons are already available, and there is no shortage of developers eager to create more.

Right AutoCAD in 2D — zooming in on dimensions

Below Rendering AutoCAD's robot in 3D model space





PCW Details

Price £3150 (plus VAT); (upgrades £495 (plus VAT) or free from previous Release 13)

Contact Autodesk 01483 303322

Good Points Good drawing aids, excellent development tools and an industry standard.

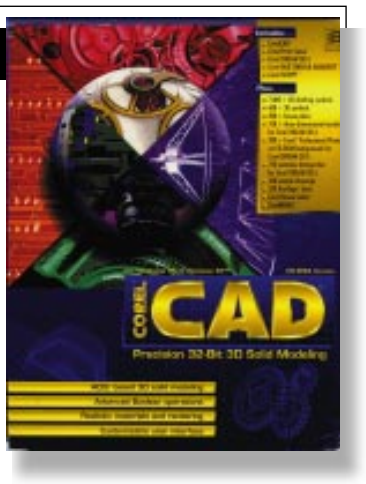
Bad Points Its long history brings a lot of baggage and limitations for a Windows 95 product.

Conclusion No-one ever got sacked for buying AutoCAD, but it's no bargain for the smaller user.

★★★★

p121 ➢

CorelCAD



This is a brand-new Windows 95 3D application, not to be confused with Corel Visual CADD, a 2D package acquired from Numera. In true Corel tradition, there's a lot here. As well as CorelCAD itself, the two CDs include Dream 3D, Print Space, a Multimedia Manager, a Script Editor, plus the usual Corel bounty of fonts, symbols, samples and clip-art. Not counting the samples and symbols, you'll need anything from 40 to 100Mb of disk space and an absolute minimum of 16Mb of RAM; 32Mb is recommended.

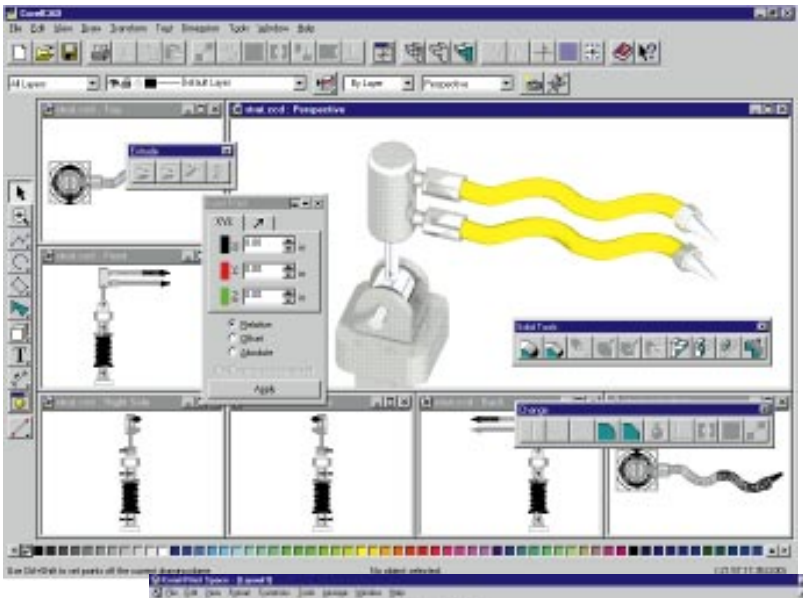
The interface sports the familiar CorelDraw look, with the main drawing tools grouped into flyouts at the left of the screen, colour palette at the bottom, more toolbars at the top and floating "roll-ups" for other options. You can open multiple drawings and, for displaying multiple viewports on a single drawing, there's an excellent view manager offering seven preset combinations plus whatever custom layouts you have saved.

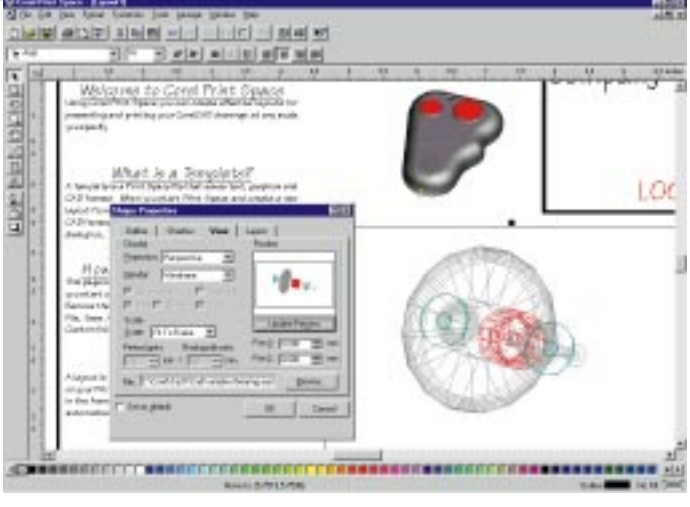
To get started, there's a book-based tutorial complemented by a series of sample drawings which take you all the way from simple 2D drawing to 3D Boolean operations. There's a good range of 3D primitives which are easy to draw. A box, for example, is started by dragging a rectangle (in perspective or isometric view) and then holding down Shift + Control. This freezes the base in the XY plane and lets you drag the height in the Z plane. Most input will need more precision, and here the input roll-up is used to enter numeric coordinates. This isn't as convenient as AutoCAD, GDS or MicroStation as you have to focus on the roll-up by pressing the Insert key (or clicking the roll-up) then Tab between the X, Y and Z fields. There is, however, a good range of snaps: the left button sets a "one-off" from the toolbar flyout, and the right button sets running snaps. As a reminder, snap points "light up" as you pass the cursor near them. Another great comfort is a multi-level Undo list.

The 3D editing tools are also excellent, with various versions of extrusion, including spirals, and an exceptionally good filleting tool. Drawing a table top, for example, you might want to round the edges — something most 3D packages can do. Here you can also define what happens at the corners: they can be mitred or rounded over. Boolean operations are well-supported and, unlike some packages, you can subtract objects that are totally enclosed within others to create, for example, a hollow sphere. Having created a solid model, there's an impressive, if rather slow, range of rendering options, including Phong, Gouraud and full ray-tracing.

We did encounter a few problems: input boxes would suddenly disappear, and we had great problems constructing spirals until realising that the help file was incorrect, giving "distance between each revolution" instead of "total distance". At times, activity seemed very slow, although this may improve with more than the 16Mb minimum memory. In common with other Corel products, Corel Script allows you to record, play back and edit macros. Samples provided include a border and title block generator and a utility to create animations using Corel PhotoPaint (available separately).

Moving on to Print Space, this is a separate application letting you assemble views of a drawing for printing — very much like AutoCAD's paperspace mode, but rather easier to use. It's very much like a DTP application in that you have a range of drawing and text tools, including spelling checker and thesaurus, to create a layout, title and notes. Like a DTP application, you create "frames" to contain graphics which, in this case, are stored as OLE links. Having inserted a CorelCAD object, you can then use the "Properties" command to select any standard or custom view of the drawing, including rendered views. You can place multiple views of the same, or different, drawings onto the same sheet for printing. It's a brilliant idea, though in practice it can be very slow — especially with perspective views — and we found on occasion the OLE links would break, resulting in empty frames. Finally, for those who want to go further than CorelCAD's built-in rendering, Dream 3D lets you build complex scenes incorporating objects constructed in CorelCAD.





Above CorelCAD struts its stuff with a selection of preset views **Right** Corel Print Space — a DTP approach to printing views of 3D models

•PCW Details

Price £695 (plus VAT)

Contact Corel 0800 973189

Good Points Friendly interface, vast supply of extras.

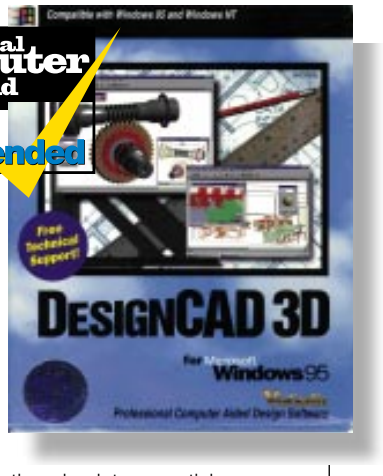
Bad Points Slow and slightly buggy on the test PC.

Conclusion Likeable and well-featured, but needs powerful hardware.

★★★

p122 ➢

DesignCAD 3D v8.0



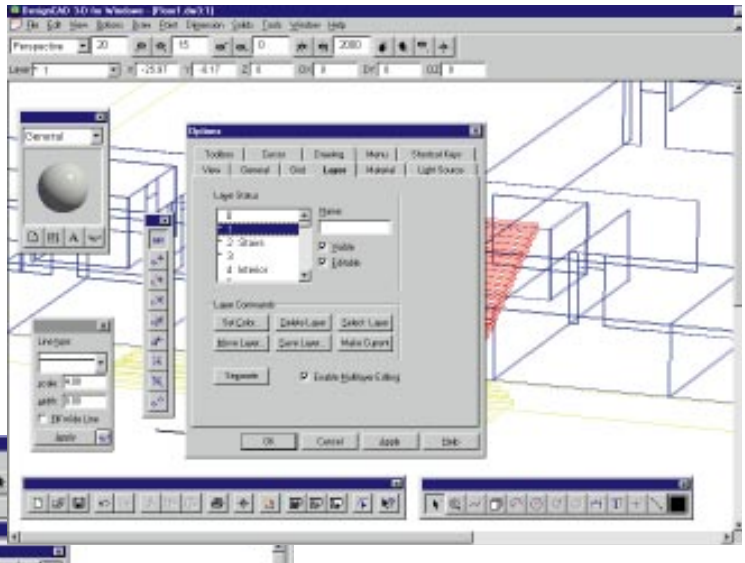
This is the flagship of a four-member fleet, with 2D and 3D versions in both 16 and 32-bit. It comes from BVG, a firm specialising in computer training, and each version comes with two video cassettes. While these are adequate on the very basics, it soon becomes apparent that the presenters are completely out of their depth on the principles involved. They don't seem to realise when they've made mistakes, and not until we get near the end of tape two do we discover how to set points numerically — an absolute CAD essential. You're actually far better off working through the printed manuals, which do much better justice to the program and explain the trickier 3D concepts, which the videos make no attempt to do.

The interface comprises a set of toolbars: a fairly standard Windows command bar offers the usual file and clipboard facilities. Other bars show layer and co-ordinate information, colours and linestyles, and provide access to the drawing and snap tools. You can drag the bars anywhere on the screen, dock them at the edges or hide them completely to free up work space, and can create your own. Working in 3D, the working area defaults to four Windows — a main perspective view with top, front and side ranged to the left. You can override this with standard Windows controls, and have several drawings open at once.

There's a healthy selection of 2D and 3D primitives, including polygons, hemispheres and cones, plus the facility to create surface from three or four joined curves or a succession of open ones. Extrusions are limited to straight lines and arcs, so you can't, for instance, create spirals this way. Entering numeric co-ordinates — once you've unearthed this information from the manual — is much easier than the video would have you believe, as rather than go through the menu, you can type a colon, semi-colon or apostrophe to get input boxes for absolute, relative polar, or relative Cartesian co-ordinates respectively. Having the three boxes separate may seem unnecessary, but it's far quicker to hit the correct key than it would be to click on an option in an all-purpose box.

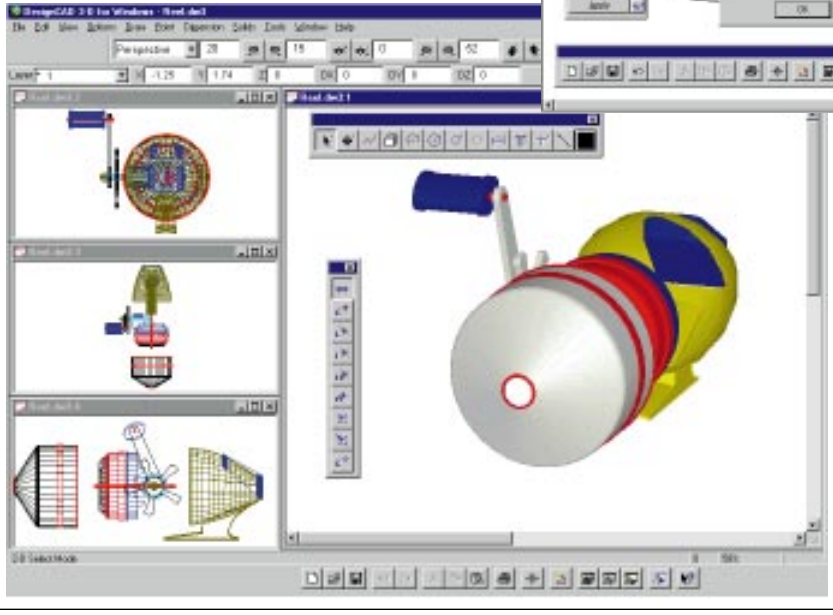
At other times, the interface can be downright annoying. There is no button, for example, to snap to the centre of a circle — you need to pull down the menu and choose "centre of gravity". Nor can you designate "running" snaps — you have to issue an explicit snap command before each point. You can, however, invoke "gravity" snap, which snaps to the nearest existing point, by using the right mouse button. This seems rather a waste, as the interface cries out for a Windows 95 context menu. There's no explicit "offset" command either, which makes it rather irksome to achieve very basic constructions such as drawing concentric circles, and it isn't possible to subtract a surface or solid that is totally enclosed within another. Selecting objects in 3D view can also be something of a struggle, and although there is a "repeat last action" command — another absolute essential — you won't find it in either the online help or manual indexes. In other respects, it conforms well to Windows 95 standards: a welcome touch is that all the options are presented in a tabbed dialogue box.

Rendering is simple but good, and you can create slide shows of rendered (or wire-frame) views to produce simple animations: select key views and the program will interpolate the intermediate steps. There's both a recorder and a BasicCad macro language, with a small number of samples, and a complete programming reference guide in the help files. Importing a 3D AutoCAD file was fast and accurate, and whereas it took far longer to export a DesignCAD file to AutoCAD's native .DWG file, the results were similarly impressive. There's a fairly primitive implementation of non-printing attributes which is confined to simple text labels, and a 700+ piece library of 2D and 3D symbols. Further libraries are available for purchase.



Above DesignCAD gains points for its Office-style options

Below 3D modelling and rendering at a knock-down price



PCW Details

Price £149.95 (3D), £79.95 (2D) (plus VAT) for either Windows 3.1 or 95 versions

Contact Burgess Video Group 01874 611633

Good Points Compact footprint, low cost, impressive feature set.

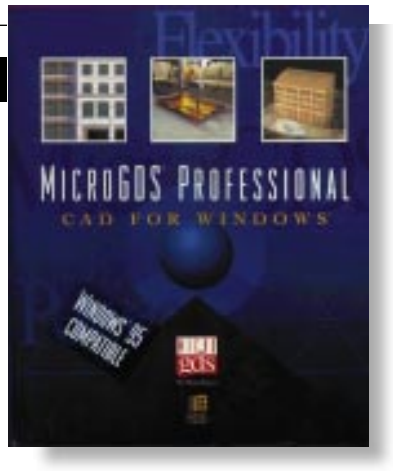
Bad Points Some rough edges to the interface — and some very rough videos.

Conclusion Excellent value for money.

★★★★

p124 ➢

MicroGDS Professional 5.0



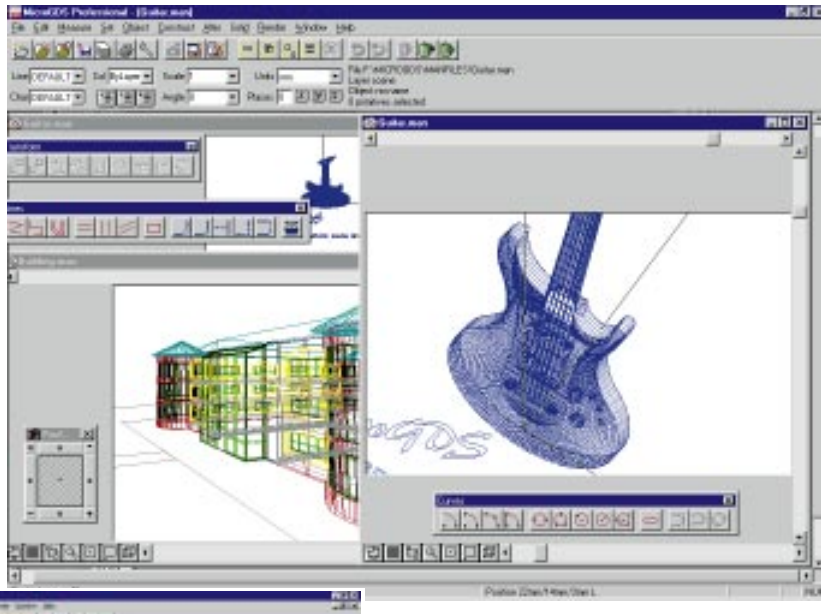
The third and last of the four-figure-price applications, MicroGDS again runs on Windows 95, NT or 3.1 with the Win32s extensions. The standard Windows 95 installation took around 46Mb and added an exuberant 22 items to our Start menu. MicroGDS places great emphasis on group work: drawings can be organised into projects, and a drawing file manager is used to maintain consistency of layers and styles. In single-user mode, creating or opening files is done with the standard Windows dialogues.

Like MicroStation, you can have multiple views of a drawing, with each window having its own set of view controls. Unlike MicroStation or AutoCAD, this extends to being able to open more than one drawing. There's an annoying tendency, however, for the views to show large "grey areas" beside the drawing, rather than fill the entire available space. This appears to happen because new drawings default to the current printer or plotter settings, and is contrary to the accepted CAD norm that you work in a virtual space until you decide to produce hard copy and set up the scale and sheet size accordingly. Another unusual touch is the use of scroll bars to zoom and rotate a 3D view, which works well. A range of standard moveable toolbars provide access to the drawing and editing commands.

User-friendliness is not a strong point. There are no tutorials: to learn this somewhat idiosyncratic application, you have to wade through the reference manual, or access the rather curt Procedures section of the Help file. It's a tough but rewarding experience, as there are some excellent touches, including excellently-implemented snaps with a "smart" cursor that changes to show the current snap point. There's a good range of trimming, joining and extending tools, and excellent one-click filleting and chamfering. Although there's no direct way to construct spline curves, a "smooth" tool will convert a series of straight line segments to curves, by using either their ends or midpoints as control points. Conversely, the "facet" tool will convert a curve or arc to straight segments. Another bonus is the facility to mix measurements. If you're drawing in millimetres, and enter a specific imperial measurement, it's automatically converted and displayed at the correct size. Other commands are not so well implemented: despite poring through the manual and help file, I was unable to find how to "mirror" an object — an essential time-save for creating symmetrical entities — without deleting the original. Using the "Copy" options to attempt the same task produced a "Topic not found" message from the Help button.

The primitives available are, in a word, primitive. If you want to draw a regular polygon, for example, you have to resort to a Visual Basic add-on, and the only way of creating 3D objects is by manipulating 2D ones. To create a cylinder or block, for example, you need to first draw a circle or rectangle in 2D and then "extrude" it along the third dimension. Things get better with rendering, with ray tracing, wrapped textures, bitmap backgrounds and a variety of special effects such as "fog" for enhancing the illusion of distance. Once again, though, working through the rendering manual is hard work, with no exercises or examples to help. Another Visual Basic add-on provides the facility to create walk-through animations, although, as the documentation admits, "The application is not intended as a fully working program, more as an example of the type of problem which can be solved using the CadLink DLL. As such, the program is not supported by GDS Corp".

There is no built-in macro or script facility, but the Application Programming Interface (API) can be accessed from most Windows programming languages and, as mentioned previously, some sample add-ons are provided in Visual Basic. OLE 2 is supported, so you can, for example, incorporate a spreadsheet table in a drawing. Dynamic Data Exchange is also supported so you can extract numeric data from a drawing and paste a link into another application such as a spreadsheet or word processor. If the object is altered, the links are automatically updated. However, this is of limited use as it only works for calculated values such as area or perimeter: you can't, for instance, link the length of a cable or pipe.



Above right MicroGDS — multiple files, but too many grey areas

Right Powerful stuff, but tough going for the learner

PCW Details

Price £2495 (plus VAT)

Contact Graphic Data Systems 01483 725225

Good Points Good workgroup facilities, can open multiple drawings.

Bad Points Poorly-featured for the price, and the lack of tutorials makes it user-unfriendly.

Conclusion No match for AutoCAD or MicroStation.

★★

p126 ➢

MicroStation 95

Personal Computer World Editors Choice

Previous versions of MicroStation were not true Windows applications. You had the choice between using the "Windows Connection" for an approximation to a Windows 3.1 look and feel, or the native Motif interface which was rather, but not quite, like Windows 95. This release is Windows 95 all the way, although it also runs on NT and 3.1 with the Win32s extensions. The three CDs also include DOS, OS/2 and Alpha NT versions of the program, and a typical Windows 95 installation takes up 66Mb.

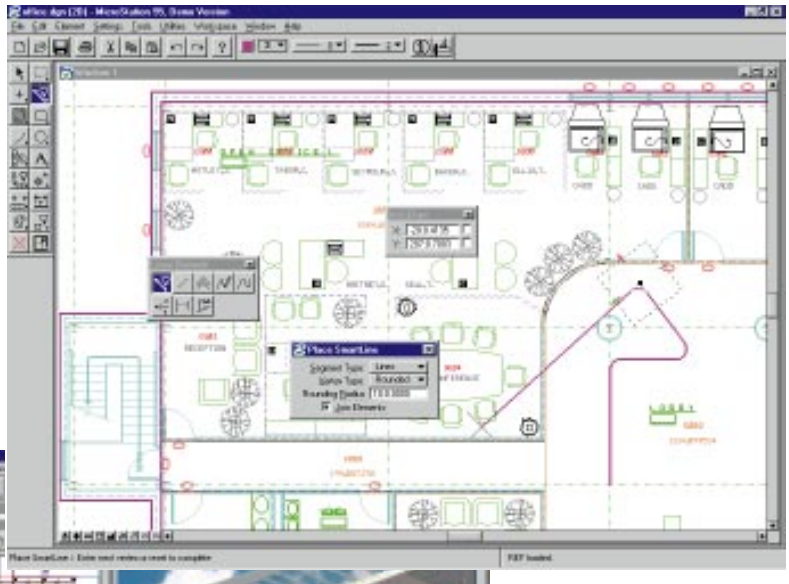
Unlike AutoCAD there are no online tutorials, but the five-inch stack of manuals includes a tutorial workbook which takes you right from the basics of 2D design to the complexities of 3D rendering. Despite the claims to Windows 95 compatibility, MicroStation doesn't use the standard File Open dialogues: the first time you run the program, it takes some trial and error to realise that you have to pull down the File menu of the MicroStation Manager dialogue box to create a new file, which you must name before you can start drawing. After that, everything becomes more familiar, with dockable toolbars and MDI windows. The main drawing tools have "tear-off" flyouts, so you can drag the entire set of dimensioning tools, for example, wherever you want on the screen. Each drawing window — you can have up to eight — has its own set of view controls, including a very intuitive "rotate" button for 3D views, but as with AutoCAD you can only work on one file at a time.

There are some clever, if rather unorthodox, touches in using the mouse: single-click on the line tool, and you can keep drawing lines until you pick another tool. Double-clicking produces a "one-off" line, then returns you to selection mode. Pressing both mouse buttons produces a "tentative" point which you can confirm or reject. Other innovations include Smartlines, which round (or bevel) their corners as you go instead of having to do this later with the filleting tools. The Accudraw feature takes some getting used to but, once mastered, is a great time saver. A dotted box appears around the last point entered, and the "rubber band" line you are drawing snaps to 90 degree directions. At any time you can type in numbers and the Accudraw box anticipates whether you are specifying distance or direction.

For most tools, a separate settings window opens. Although this is useful for specifying, say, the colour or thickness of a line, some of the options, such as the different ways of drawing a circle, would be better catered for by having separate buttons in the fly-out. Other interface elements show a disregard for Windows conventions: toolbars are listed in the Window menu, many dialogue boxes don't have an OK button, and, to bring a cascaded window to the top of the pile you have to click the title bar — not anywhere in the window, as normal.

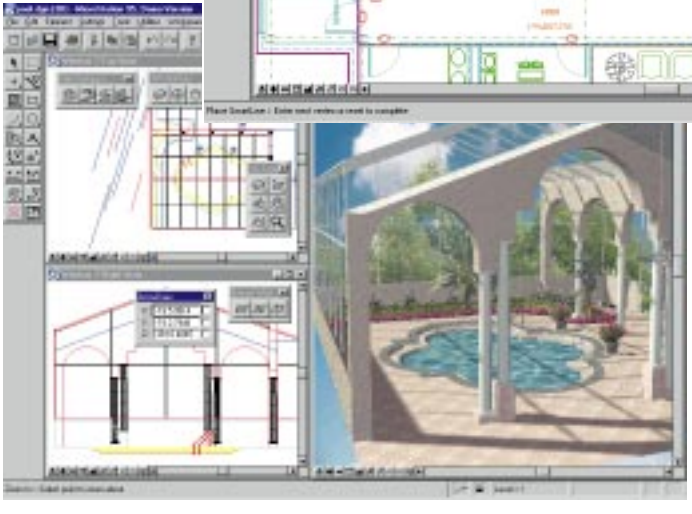
The 3D facilities are excellent, with a good range of primitives, surfaces and trimming and filleting tools. Superb rendering includes the facility to incorporate bitmaps both as background and foreground; the latter means that images of human figures or trees, for example, can be mapped onto a transparent drawing object as "cut-outs" for added realism. A built-in animation generator will create "walk-throughs" and save the result as a .FLI file which can be played back in its own window with the Movies utility. Similar techniques can be used to create solar studies: enter the time and place, and watch the shadows cast by your building over the day. A new development, QuickVision, promises software-only real-time manipulation of rendered views. This was not included in the review software but will be free to registered users.

Like Autodesk, Bentley is fully aware of the need for customisation and vertical solutions, and programming interfaces include MicroStation Basic, OLE Automation, and MicroStation Development Language (MDL). Through the MicroStation Openspace scheme, Bentley has pledged to invest in — or acquire — third party developers to create "Spaces" (user-specific add-ons) for every key application area — architecture, plant design, terrain modelling, civil engineering and so on.



MicroStation's Smartlines and Accudraw at work

Stunningly-rendered visualisations



PCW Details

Price £3495 (plus VAT)

Contact Bentley Europe 01344 412233

Good Points Very well-equipped, stunning rendering.

Bad Points Eccentric implementation of Windows 95 interface.

Conclusion Being number two, Bentley tries harder.

★★★★★

p129 ➢

XCad 3.1

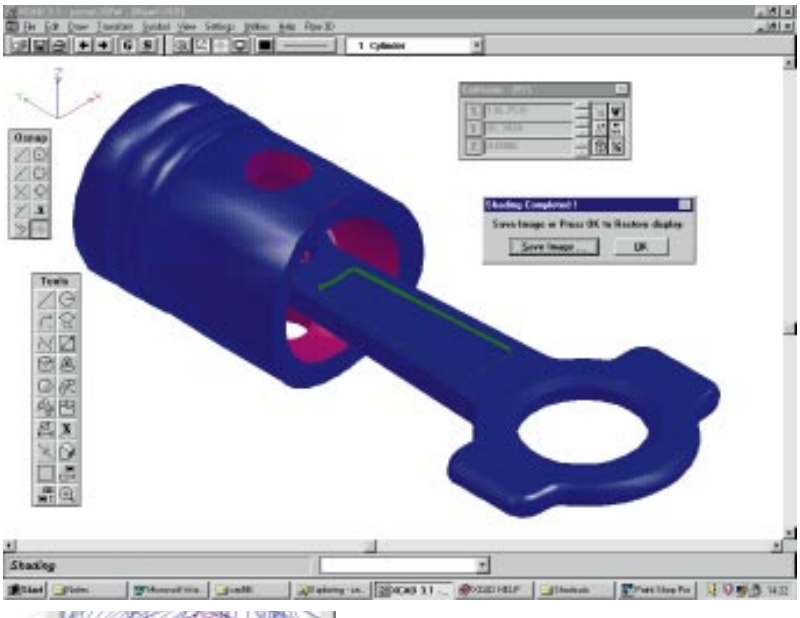
Another 32-bit, 3D product, XCad runs under Windows 95, NT or 3.1 with Win32s extensions. Somewhat more modest than the competition in its requirements, it's claimed to run in 4Mb on a 386 PC, and the standard installation took up 11Mb. A simple, uncluttered interface consists of top button bar containing the usual file commands, undo and redo, layers, linetypes and on/off buttons for the grid, snap tools and other aids. The drawing tools are contained in a floating toolbox, with a wealth of fly-out options. Other palettes include the snap controls, co-ordinate input, a small "global" overview for zooming and panning, and a set of controls for rotating the 3D viewpoint. As with AutoCAD and MicroStation, you are limited to one file at a time, but you can display up to eight views simultaneously.

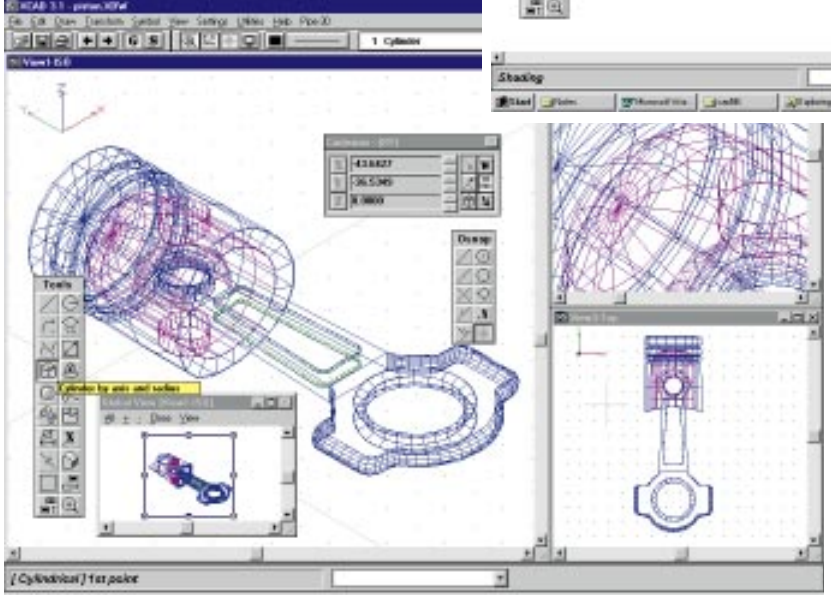
Inputting points via the co-ordinate box is a fiddly business: you either have to double-click on the relevant X, Y, and Z field, or use the function key shortcuts. As you type in each value, say for the start and end points of a line, the relevant coordinates are "locked". The good side to this is that you can anchor a point in one or two dimensions and stretch the third with the mouse, but the down side is that you have to unlock the boxes to draw the next point. Some activities, such as drawing a 3D block, are done far more sensibly. Having defined two dimensions, you are prompted to enter the third directly into the command area, without having to click or otherwise change focus. The snap controls are also limited in that you can only have one active at a time. You can't, for example, snap to whichever is nearer out of the end and midpoint of a line. Unlike most drawing programs, there is no "Select" mode: each drawing tool stays active until you pick another, and to transform or delete an object you perform the command, then choose the object.

The main toolbox is spectacularly well-equipped. The fly-outs offer ten ways of drawing lines, eight ways of drawing a circle, and twelve of defining a surface, as well as a good selection of 3D primitives including cone, torus and full or partial sphere. There are also some sophisticated ways of joining surfaces or solids, such as "blending" shapes to create smooth transitions. The co-ordinate box does have its better points, such as a button to switch between the three main work surfaces, to draw circles, for instance, in the XY, YZ or XZ planes. You can also define user planes. Say you wanted to draw some skylights on a pitched roof: you can define the slope of the roof as a user plane and draw straight onto it, rather than have to work out the X,Y, and Z co-ordinates of each point.

Rendering was spectacularly fast and, although lacking the sophistication of Corel or MicroStation, it has a choice of light sources, materials and background bitmaps. There's a macro recorder which records only commands, not parameters. This might seem limiting but is actually rather good, as you can record a complex series of commands to create a shape, then replay the macro to input different values. To take a simple example, if you start the recorder and create a tube by copying two concentric circles along their Z-axis, then join them to form the outside, inside and end surfaces, you can play the macro back and input new values for the diameters and length to create a different tube. For more advanced customisation there's the XDL development language and compiler to add new menu commands: samples include a tool for creating 3D pipe layouts, specifying diameter and minimum bend radius, and a gearwheel generator.

When we last looked at XCad it was still in beta and rather unstable. This version seems solid enough, although not all the Windows 95 features, such as the File Open/Save dialogues, are implemented. A new version, 4.0, is promised shortly.





Above Fast rendering — the XCad piston in solid view

Left XCad — surface sophistication in a low platform product

PCW Details

Price £495 (plus VAT)

Contact Digital Multimedia 0181 893 4000

Good Points Fast and friendly with sophisticated surface generation.

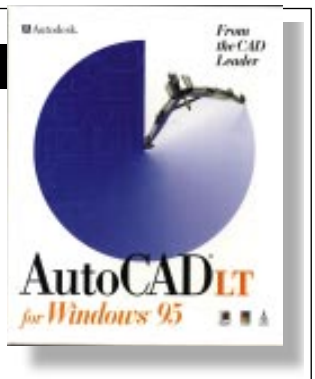
Bad Points Awkward co-ordinate input.

Conclusion We're waiting for the new version.

★★★

p134 ➢

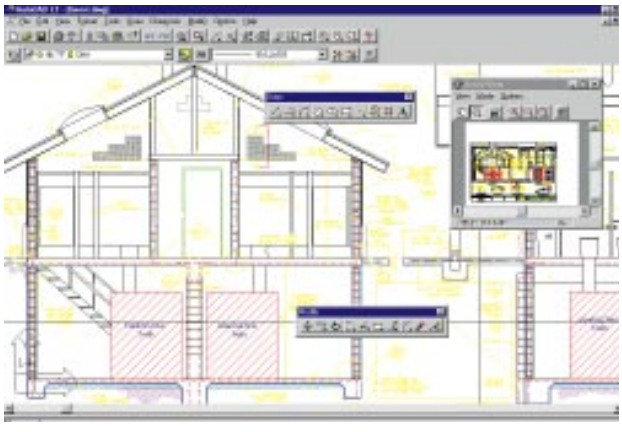
AutoCAD LT



AutoCAD LT is a rather strange hybrid. It has practically all the two-dimensional drawing commands of its big brother, but the only 3D constructional command is drawing simple lines. You can, however, load 3D drawings, view them from any angle in multiple viewports, and combine views for plotting in "paper space", just as you can with release 13. You can remove hidden lines and shade a model, but you don't get the full rendering capabilities.

Since its initial release, it has been brought up to date with this Windows 95 version and has a very similar look and feel to the major product, with similar toolbars, viewport controls and an aerial view window for navigating large drawings. Standard features now include long filenames, OLE, MAPI email support, ToolTips, "how-to" panels and a spelling checker. In some respects it has leapfrogged release 13: you now, for example, get a "Wizard" to help set up new drawings and a "property painter" to copy multiple attributes between objects. An excellent online tutorial covers the same ground as the 2D sections of AutoCAD proper, and there's an orientation guide for those making the great leap from the traditional drawing board.

There are no symbol libraries supplied, but there is a rather less useful collection of WMF-format clip-art. You don't get the development and customisation capabilities either, apart from editing the menus and toolbars or running simple scripts of commands. Although expensive for a 2D drafting package, the marketing philosophy is that at less than a sixth of the price of the full release 13, it provides companies already committed to AutoCAD with a totally compatible mid-range product for those, such as managers or trainees, who need the AutoCAD basics without the full panoply of the major product.



Draw in 2D, view in 3D — Autodesk's £595 solution

PCW Details

Price £595 (plus VAT)

Contact Autodesk 01483 303322

Good Points Can view, but not edit, AutoCAD 3D drawings.

Bad Points Expensive for a 2D drawing package.

Conclusion Useful for firms that already have the full AutoCAD release, but poor value as a standalone package.

★★

Corel Visual CADD

Formerly developed by Numera, this is a 2D package historically unrelated to the 3D CorelCAD. It is, however, a true Windows 95 product and bears the "Microsoft Office Compatible" logo. A simple interface consists of just two fixed bars. The speedbar, at the top of the screen, has file, clipboard, undo, layers, zoom and linestyle controls. All the drawing and editing tools are in another fixed bar to the left which expands into flyouts of related commands. As in previous versions, you can open multiple files and, thankfully, the limitation of a single viewport per file has been lifted.

Data entry is fast and easy: if you want to specify points from the keyboard, you just type them in without having to focus the input, and simple two-letter codes (or a click on the status bar) switch between absolute and relative modes. Diehard CLI addicts can dispense with the toolbox by typing other two-letter commands such as "li" to start a line. Object snaps can be selected from the right mouse button menu, as can options such as "tracking": if you want, say, to draw a hole 50mm up and 70mm across from the corner of a bracket, turn on tracking to draw the construction lines to the point, turn off tracking and draw the circle — the construction lines automatically disappear. This right-button menu also lets you close a shape, end drawing or undo the last segment of a line. Another neat trick is being able to work in "ortho" mode but being able to instantly alter the origin direction — think of drawing a plan of a row of houses on a street running diagonally.

It is being marketed by Corel and distributed through FastCAD, with UK symbol libraries available as extras. Most of the bundled symbols are US/Imperial based. As with the major products it sports an open architecture, and a help file explains the Application Programming Interface which can be accessed by third-party developers using languages like C++, Visual Basic or Delphi.

The other Corel — 2D CADD with some neat tricks

PCW Details

Price £349

Contact FastCAD Europe 01923 495496; Corel 0800 973189

Good Points Well-designed drawing interface and open architecture.

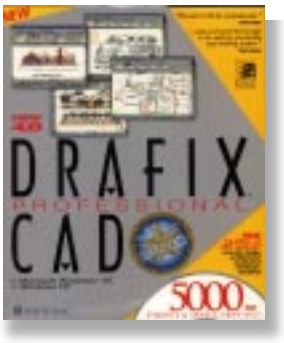
Bad Points Expensive for a 2D package.

Conclusion Serious 2D CAD, but faces tough competition from both ends of the market.

★★★

p136 ➢

DrafixCAD Professional 4



Drafix Professional is a 2D-only drafting program and comes with all the Windows 95 bells and whistles such as email support, right-button context menus, and even a tip of the day. As well as having standard MDI windows on the same or different file, you can also split each one into two or four panes, each with its own zoom level and scroll bars. A bar for linestyles, layers and patterns can be docked either at the top or bottom of the screen, as can the co-ordinate bar. The drawing tools and general toolbar can be placed anywhere. You can also have a scrolling palette of library symbols. Although the buttons are tiny, a full description of each appears on the status line.

There are fifteen ways of entering a point in Drafix, with a variety of snap modes, constraints and keyboard input methods. You can access all of these from two flyouts on the main toolbox but this soon becomes extremely irksome, especially as snaps are mutually exclusive. If you have "endpoint" set, for example, you can't place a point anywhere else on the drawing — the usual method of having a snap "catchment area" isn't implemented. Things get better when you learn the single-letter keyboard codes, and with practice you can fly around from endpoint (E) to intersection (I) or enter absolute, relative or polar co-ordinates from the keyboard using the A, R and P prefixes.

The "Professional" title isn't just market-speak. A serious database feature means you can define and export non-visual attributes of an object, along with properties such as length or area. This means you could create "Unit cost" and "Supplier" fields to objects, export the results to a spreadsheet, then calculate, for instance, the total area and cost of floor covering, or the total length of network cable. There's also a fully-documented macro language, and a CD-based library of over 5,000 symbols covering architecture, mechanical and electrical engineering, networking, home and office furniture, and landscaping — again, all documented in a printed manual.

Extremely competent budget 2D — even cheaper without the pro trimmings

PCW Details

Price £195 (plus VAT)

Contact Roderick Manhattan 0181 875 4444

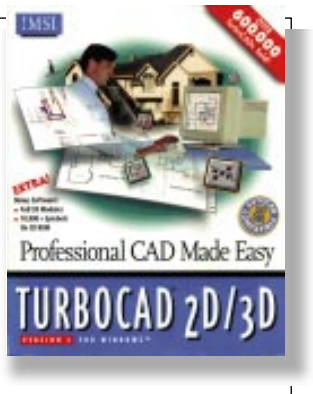
Good Points Fast, with advanced macro and database capabilities.

Bad Points Inflexible snap modes take getting used to.

Conclusion Solid-value 2D drafting.

★★★★

TurboCAD 2D/3D



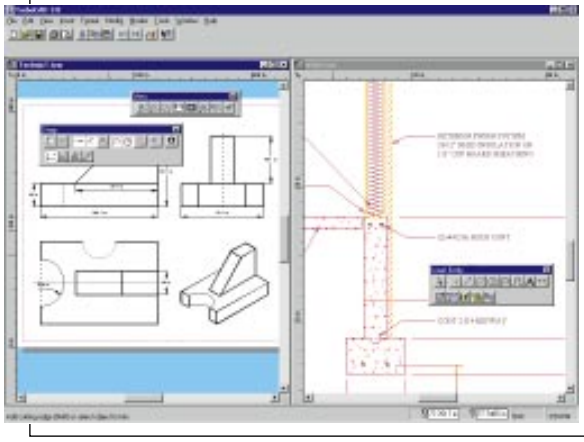
The title is a trifle misleading as this is two separate products. The 3D side was formerly known as 3D Design Plus and seems little changed from 1994, with a rather strange interface, a good range of primitives, shading and animation, but rather poor drawing aids. Still, it's fun to experiment with and certainly the cheapest 3D available. The 2D side is a completely different and far better application, with a standard Windows 95 interface.

The range of drawing tools is good, and the editing and trimming tools even better. Particularly impressive is the one-shot way you can trim the intersections of double lines, to give "open" tees and crosses: anyone who has struggled to tidy up window glazing bars will appreciate this. The right mouse button, so often relegated to an "enter" or "cancel" key in CAD, is fully Windows 95 equipped and works well with the snap bar — you can have multiple running snaps active — to connect, say, the centre of a circle to the endpoint of a line, and override these for a "one-off" from the context menu.

You can mix and match mouse and keyboard entry by typing Control + E to get to the edit bar — to define a line, say, by direction and length, or Control + R to specify Cartesian co-ordinates. The $ and @ symbols can be used to toggle relative and absolute co-ordinates, saving a mouse click.

You can open multiple files but, somewhat oddly, not have multiple windows open on the same file, although you can save named views. There's a good range of bundled symbols with drag-and-drop entry, but these are somewhat marred by having no idea of scale. Whether you're drawing full-size or at a scale of 1:50, dragging in the kitchen sink, for example, gives an entity 0.3 inches wide, which makes for a lot of laborious rescaling.

Finally, you get a Basic-style scripting language, documented in the help file, and some sample macros — one of which crashed TurboCAD.



Multiple files and neat editing tools make this the best TurboCAD yet

PCW Details

Price £69.95 (plus VAT)

Contact IMSI 0181 581 2000

Good Points Excellent budget 2D drawing with a greatly improved interface.

Bad Points The 3D facilities are poor and unintegrated.

Conclusion Excellent entry level — but keep the 3D "just for fun".

★★★

p139 ➢

Editor's Choice

With prices ranging by a factor of 50, the concept of an overall best buy is rather ridiculous. It's much more relevant to consider needs first. If you're buying for a large architectural or engineering practice, with projects spanning several years, then you'll be looking not just for sheer drawing power, but also the confidence that the product will continue to be developed and supported in years to come. The high price of the three top-end products is then mitigated by the sheer momentum of the installed user base. Although AutoCAD, with a claimed 1.5 million users worldwide, is undoubtedly the leader, we found MicroStation more capable and, despite a rather vague idea of the Windows 95 interface conventions, more elegant. We felt the third top-end contender, MicroGDS Professional, although cheaper, didn't come up to the standard of the other two. Consequently, as a money-no-object Editor's Choice, MicroStation takes the prize.

Dropping down to entry level, mere mortals — ranging from smaller design or engineering practices to one-man bands — have first to ask the crucial question, "Do I need 3D?" If not, then we'd plump for either version of Drafix. If you don't need the macro language, then £69 will buy you Drafix QuickCAD, an excellent introduction to the business of computer draftsmanship. If you do need 3D on a budget, then DesignCAD 3D offers astonishing value for money.

In the 3D middle ground, things get a lot more difficult. We'd love to nominate Corel CAD as man of the match but for the fact it's just too, too slow. XCad is fast and well-equipped, but we'd like to see the full Windows 95 version (in development at time of writing) before committing ourselves. Which takes us neatly back to DesignCAD 3D: highly commended, and unbeatable value.

Other products available

We simply don't have room to cover every single product on offer, but here is a brief guide to the rest.

Autosketch 2.1 (Autodesk 01483 303322, about £79). Brilliant budget 2D drafting with button bars that can replace all the menus. Way ahead of its time when launched, but now looking rather neglected by the company.

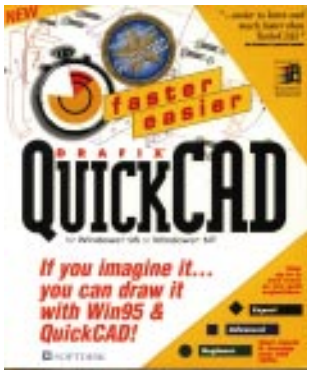
MicroStation Powerdraft 5.5 (Bentley 01344 412233, £1895). Sibling to MicroStation, featuring the same Accudraw and Smartline technology, but with greatly-reduced 3D capabilities.

Drafix QuickCAD 4.0 (Roderick Manhattan 0181 875 4444, £69). Same features as Drafix CAD Professional, less the macro language, symbols and customisation, but with a three-level interface to make life easier for beginners.

EasyCAD Windows 4.5 (FastCAD 01923 495496, £149). Entry level 2D with an antique interface — drawing tools can only be accessed from the menus or command line. Fast and well-equipped, however.

TommySoft CAD (Thompson Partnership 01923 246427, shareware). Windows 3.1 2D drafting originating from Germany. Truly bizarre interface features mystifying cascading toolboxes, but fans claim it to be powerful.

DeltaCAD (Midnight Software US 1-800-242-4775, shareware). Simple 2D package featuring an unusual, but rather cute, tabbed toolbar. Featured on our cover CD in September.



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Hardware

The bad news is that for serious CAD work you need the best of everything. Lots of memory to store huge 3D models (the robot arm in the AutoCAD screenshot, page 121, is an 8Mb file) and as fast a processor as possible to cope with the vast throughput of floating-point arithmetic.

We ran our tests on a 16Mb P100, which should be regarded as an absolute minimum for anything but the most elementary work. At any level, however, a fast display card is essential if you want to avoid agonising delays while the screen is redrawn. Unless you're doing high-quality rendering, 256 colours is ample — more will slow down redraws — but a minimum resolution of 1024 x 768 will save a lot of time zooming and panning.

Don't stint on the monitor either: key qualities here are flicker-free (a non-interlaced refresh rate of 75Hz or better), low distortion (you want straight lines to look straight) and high resolution (at least 1024 x 768 on a .26mm dot pitch, 17in display).

For input, the traditional digitising tablet is only really necessary if you have a longing for the days of tablet-mounted command overlays or want to convert paper drawings; even then, it's probably easier to get the latter scanned by a bureau and stick with a low-cost, low-footprint mouse.

For large-size quality output, you'll need a plotter: A1 inkjets start at about £1,200, and A0 at about £1,800. For smaller drawings any kind of graphic-capable printer is fine: an A3 inkjet can be had for under £400, and a wide-carriage dot-matrix will take A2 portrait. Bear in mind that some packages, especially the budget applications, will let you tile a large drawing onto several printer pages. Swallow your pride, tape them together, and take them to a bureau which has a giant-size copier.

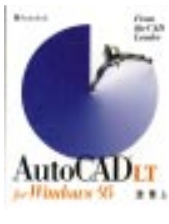
You'll need a flicker-free, high-resolution, low-distortion monitor to make the most of CAD software

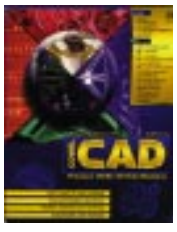
Jargon-buster

Array	Multiple copies — either in a rectilinear grid, such as windows on an office block, or in a circle, such as spokes on a wheel.
Associative dimensioning	Dimension lines and numbers, updated when the associated object is resized.
Attributes, non-graphic	Non-printing information that can be stored in a drawing file, such as the price and supplier of a component.
Boolean operations	Combining shapes by adding, subtracting or intersecting — e.g. "drilling" a hole.
Chamfering, filleting	Creating an angled or rounded corner at the junction of two lines or surfaces.
Co-ordinates	Absolute co-ordinates refer to the distances from the origin (zero point) of a drawing. Relative co-ordinates refer to the last point entered.
DXF	Drawing eXchange Format: an open file format, developed by Autodesk for exchanging drawings between applications.
Hidden line	A line in a 3D wireframe, such as the back edge of a cube, that can be temporarily removed to give a more realistic view.
Layer	A way of sorting objects in a drawing. For example, a building's pipework can be assigned to its own layer, and then hidden, shown or protected from change.
NURBS	Non-uniform rational b-splines: the way complex curved surfaces are stored.
Offset	Reproduces a shape a set distance inside or outside the original. For example, the inner profile of a complex wall from the outer.
Ortho mode	Constraining the drawing cursor to 90-degree angles.
Polyline	A set of connected line and curve segments treated as a single object.
Primitive	A shape — circle, line, cylinder or sphere, for instance — drawn with a single command.
Rendering	Giving a snapshot view of a wireframe model realistically-shaded surfaces.
Snap modes	A vital drawing aid that lets the user place points precisely related to other objects, such as the end or midpoint of a line, the centre or tangent of an arc.
Symbols (blocks, cells)	The CAD equivalent of clip-art: standard components such as bolts or window frames that can be stored for re-use in a library.
Working Plane	The "slice" through a 3D model in which the cursor is currently moving.

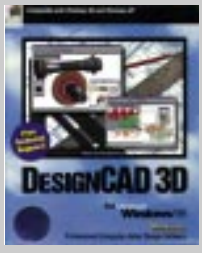
p143 ➢

Table of features



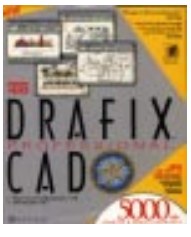


Personal Computer World Highly Commended

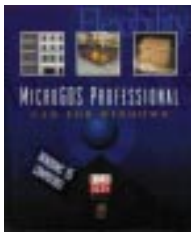


Product	AutoCAD r13	AutoCAD LT	CorelCAD	Corel Visual CADD	DesignCAD 3D
Contact	Autodesk	Autodesk	Corel	FastCAD	BVG
Telephone	01483 303322	01483 303322	0800 973189	01923 495496	01874 611633
Price (excl VAT)	£3,150	£595	£695	£349	£149.95
Platform	DOS, Win 3.1, 95, NT	Win 95	Win 95, NT	Win 95	Win 3.1, 95 (separate versions)
Min. processor	486	486	486	386	386
Min. RAM	16Mb	16Mb	16Mb	8Mb	4Mb
Disk space - standard installation	70Mb	30Mb	100Mb	18Mb	13Mb
2D/3D	3D	2D + 3D viewing	3D	2D	3D
Multiple files	❍	❍	●	●	●
Multiple views on same file	●	●	●	●	●
Tutorials	●	●	●	●	●
Number of layers	No limit	No limit	No limit	1024	256
Macro language	●	●	●	●	●
Development API	●	❍	❍	●	❍
Non-visual attribute export	●	●	❍	●	❍

Table of features



Personal Computer World Editors Choice



Product	Drafix CAD Pro	MicroStation 95	MicroGDS Pro 5	TurboCAD 2D/3D	Xcad
Contact	RMG	Bentley	GDS	IMSI	Digital Multimedia
Telephone	0181 875 4444	01344 412233	01483 725225	0181 581 2000	0181 893 4000
Price (excl VAT)	£195	£3,495	£2,495	£69.95	£495
Platform	Win 95	DOS, OS/2, Win 3.1, 95, NT	Win 3.1, 95, NT	Win 3.1, 95	Win 95
Min. processor	486	486	486	386	386
Min. RAM	4Mb	16Mb	16Mb	4Mb	4Mb
Disk space - standard installation	8Mb	66Mb	46Mb	8Mb	11Mb
2D/3D	2D	3D	3D	2D and 3D (separate apps)	3D
Multiple files	Y	N	Y	Y	N
Multiple views on same file	Y	Y	Y	N	Y
Tutorials	Y	Y	N	Y	Y
Number of layers	256	63	1024	Not documented	4000
Macro language	Y	Y	N	Y	Y
Development API	N	Y	Y	N	Y
Non-visual attribute export	Y	Y	Y	N	N

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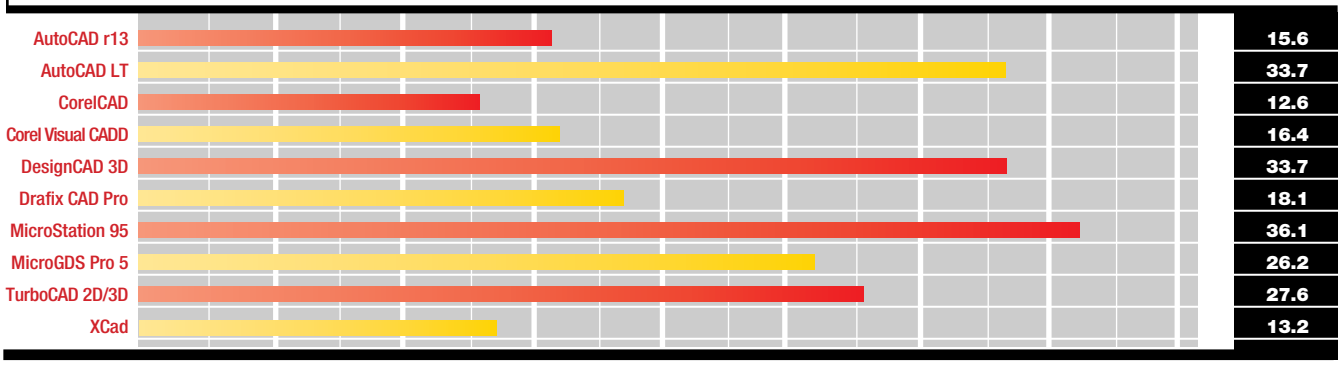
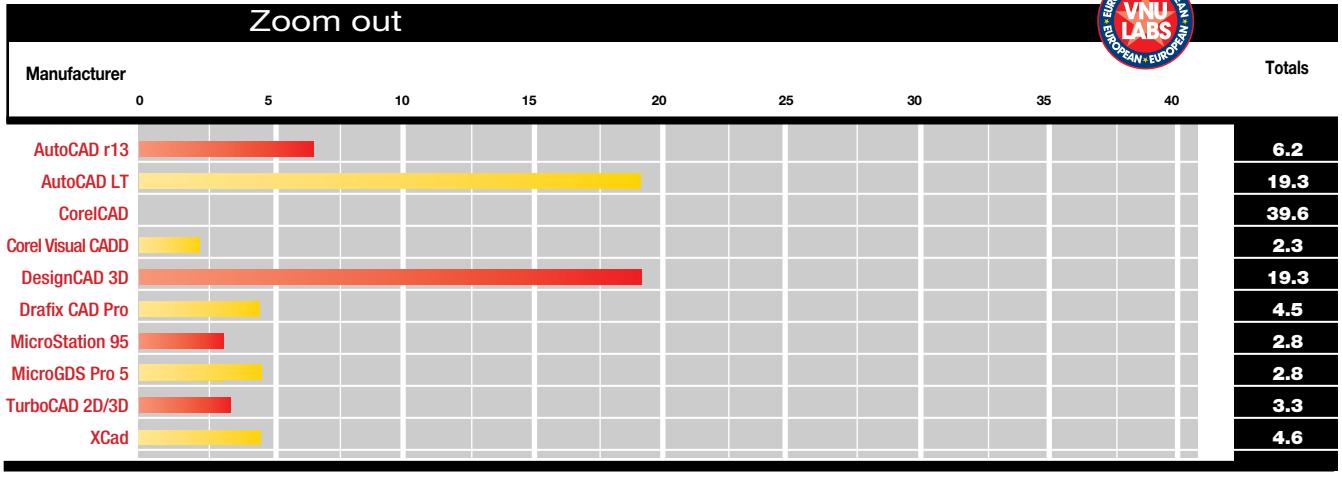
Speed - import 2D DWG



Zoom out



Rotate

Finding a level playing field to compare performance limited us to two dimensions. We first took a standard DXF file, and timed how long it took to import and display. Microstation, XCad and TurboCAD all refused to import the file, so we used a native AutoCAD release 12 file, which gave the two Autodesk products an advantage. We then timed how long it took to redraw the entire display after zooming out from a detail. Finally, we rotated the drawing by 90 degrees; not just a change of viewpoint, but a true rotation (and recalculation) of every entity in the drawing. Times are given in seconds.

LASER PRINTER photography by David Whyte

Group Test: Budget Laser Printers

Pick of the bunch

The choice of budget laser printers is now so wide that it really is hard to see the wood for the trees. Eleanor Turton-Hill chooses twelve to tempt you.

As the market for laser printers has developed, competition between manufacturers has become increasingly fierce, especially in the production of budget models. Prices have gone down and down as manufacturers have found new ways of cutting costs. Generally, this process has been good for the consumer. Prices are lower and there's a much larger choice of budget products available. Output quality has improved, with 600dpi resolution becoming more standard, and build has become smaller, making them more suited to home use. In short, the printer market has followed the familiar industry pattern. Continual advancements in technology combined with increased market competition have created a better deal for the consumer.

The downside is that the increased number of products available makes a buying decision more difficult. There's an endless variety of features and options to choose from. Each model has a slightly different balance of components: some are optimised for high-speed Windows printing, some are networkable, while others are for purely personal use. Only some models provide a Mac interface, and only some allow printing from native DOS applications. The choices go on and on…

Here, we've gathered together 12 budget laser printers with street prices ranging from about £210 to £365. The features offered in each model vary considerably, and often there's little correlation between overall functionality and price. We've shown exactly how manufacturers can cut corners in printer design, carefully assessing the features of each model to give you a clear idea of which one best suits your needs.

There are many different ways of cutting the cost of a printer. The most obvious way is to use a slower engine, but some manufacturers skimp on other basic components including memory, PostScript options, network compatibility, and paper handling features. Others have chosen to use GDI (Graphical Device Interface) technology which cuts down the cost of production even further, using an innovative printing method which greatly simplifies design. GDI technology has brought the price of lasers down considerably over the past two years, but in many ways, it has also served to confuse the consumer.

Different printer manufacturers implement GDI technology in different ways, each method having its own advantages and disadvantages. Four of the printers reviewed here use the Microsoft Windows Printing System, a standard set up to create a universal architecture for GDI printers. Other models use a combination of GDI technology and traditional architecture, allowing fast printing from Windows as well as support for native DOS applications. Others do not use GDI technology at all, instead following the traditional printer architecture with their own internal electronics and memory.

The winners in this round-up have been selected for their overall value for money. Each printer has been put through its paces in our labs where tests are carried out on performance, output quality and usability. The results have then been weighed up against upgrade options, available interfaces, and overall design advantages.

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Laser Printers Contents

Group Test: Budget Laser Printers

Brother HL 730

Personal Computer World Editors Choice

Brother was one of the first companies to combine GDI technology with traditional design, allowing fast printing from Windows as well as support for native DOS applications. The first budget laser to use the idea was the HL 630. This one, the HL 730, is basically the same 6ppm model, but with some design changes and an improved engine.

The driver provides accurate bi-directional feedback and printing is fast on all sorts of documents, including graphic images and photographs. This is partly because of the compression technology incorporated into the software for speeding up the printing process. When printing very large files, this technique does require a certain amount of free hard disk space so that a spool file can be created before the job is sent down to the printer.

The 730 is not really suited to cramped environments as its large flat design demands plenty of desk space, especially with the output tray jutting forward. The whole printer is built like a ski slope with the input hopper high up at the top rear of the machine. The driver software has a built-in duplexing utility which guides the user through the process of printing first one side and then the other side of the paper.

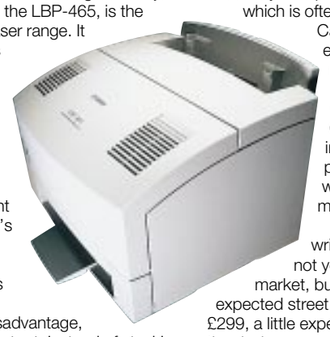
The HL-730 produced excellent scores on our tests both for quality and speed, and, in general, it was a real pleasure to operate. There were no problems with the drivers, paper feeding or stacking. It's also versatile, supplying both a Mac driver and support for native DOS applications using LaserJet IIP emulation. In both these modes, however, the maximum resolution falls to 300dpi.

PCW Details

Price £270
Contact Brother 0161 330 6531
Good Points Fast. Stunning-quality output.
Bad Points Big.
Conclusion Excellent value for money.
★★★★★

Canon LBP-465

Canon produces a whole range of printers using both inkjet and laser technology. This model, the LBP-465, is the new budget 4ppm model in the laser range. It conforms to Microsoft's Windows Printing System and can function only from Windows. PCL 4 emulation is provided for printing from DOS applications, but this will only work from a DOS box in Windows.



Setting up was relatively painless, partly because a Quick Start Card is provided with the printer explaining how to install the toner cartridge. The design helps, as the whole front of the printer opens out, making the machine's innards clearly visible. The driver software comes on three disks and the installation routine configures the printer automatically as the default.

Design-wise, this printer has one major disadvantage, especially if you're short of desk space. The output, instead of stacking vertically, simply churns straight out onto the desk in front. To operate effectively, this printer really needs a desk of its own — something which is often not practical in small offices.

Canon's wide experience in the printer market is evident in many other aspects of the design of this model. The documentation is well-constructed, making most operations easy for new users.

Output quality is also excellent, producing stunning 600dpi documents. That's a significant improvement on the LBP-460, this model's predecessor, which only managed 300dpi.

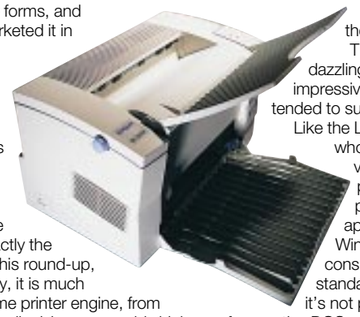
At the time of writing, this printer is not yet available on the market, but it has an expected street price of about £299, a little expensive considering the design annoyances and lacklustre performance results.

PCW Details

Price £299 (expected street price)
Contact Canon 0121 680 8062
Good Points Excellent quality output.
Bad Points Design annoyances, slow.
Conclusion Not the best deal in this round-up, but the street price may well fall.
★★★

Epson EPL 5500W

GDI technology now takes many forms, and printer manufacturers have marketed it in different ways. Some have combined GDI with the traditional architecture, others have opted for Microsoft's WPS system; but most have decided on one definitive design for the budget model in their range. Epson has decided to market three different models, one using the WPS, one using traditional architecture, and one using PostScript.



Here, we've tested the EPL 5500W, the WPS model. Superficially, this appears exactly the same as the Lexmark Optra E included in this round-up, but because this one uses WPS technology, it is much cheaper. The two models both use the same printer engine, from Minolta. Under test this printer performed well, giving reasonably high scores on all document types. The speed difference with the Lexmark, particularly on bitmap and graphic images, is interesting. Both printers use the same engine, but this Windows printer produces much higher scores because data is transferred from the PC to the printer more efficiently.

The quality tests also produced good, but not dazzling, results. Photographic images were particularly impressive, but large blocks of grey within a graphic image tended to suffer from slight banding problems.

Like the Lexmark, the Epson was easy to set up with the whole top of the machine opening out to give a clear view of the inside. HP LaserJet Series II emulation is provided for printing from DOS applications within Windows, but, consistent with the standard architecture, it's not possible to print from native DOS applications. The documentation is well written in plain English and packed full of simple diagrams to help new users.

PCW Details

Price £245
Contact Epson 01442 61144
Good Points Good performance.
Bad Points Slight banding problems on some types of graphic image.
Conclusion Reasonably-priced WPS printer. Neat design.
★★★

HP LaserJet 5L

This budget printer from HP has been on the market for about a year. It's a 600dpi model with an engine speed of 4ppm. Design-wise, it is unusual. It is built with vertical paper hoppers placed one in front of the other, with input at the back and output at the front. Plastic paper supports slide out at the front and back, 100 sheets in each.

The technology used in this printer follows traditional wisdom, with PCL5e used as the control language and 1Mb of RAM installed as standard. GDI technology is not used at all, at least not in the usual sense of the term, but the Windows driver is host-based and uses bi-directional handshaking to speed up the printing time. Unfortunately, this technique did not produce stunningly good performance on all parts of our tests. Text printing produced reasonable scores, but bitmap and graphic images were pitifully slow.

In terms of operation this machine was fairly hassle-free and there were no paper feeding or stacking problems. A lever at the bottom of the printer allows you to change the paper path from the output bin to a lower position in which finished documents are deposited on the table in front of the printer. The paper path is straighter this way, which is useful for duplex printing or envelope printing.

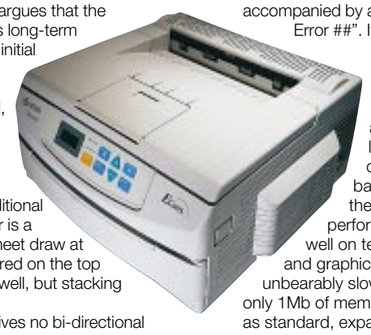
The poor performance scores were compensated for by excellent-quality text and graphics churned out at true 600dpi resolution. Still, this model seems a little overpriced for what you get, especially when compared to the slightly cheaper Brother HL 730, a 6ppm printer providing much faster output on all file types.

PCW Details

Price £286
Contact Hewlett-Packard 0990 474747
Good Points Good-quality output.
Bad Points Slow on bitmap and graphic images. Documentation could be improved.
Conclusion Innovative technology used by other manufacturers has left HP's LaseJet 5L looking outmoded.
★★★

Kyocera FS-400

Kyocera is famous for its environmental and cost of ownership campaign which argues that the real cost of a printer lies in its long-term maintenance, rather than its initial price tag. Most of Kyocera's printers are aimed at the higher-end corporate market, but this one is the budget model, offering 4ppm 300dpi printing.



Lined up against the other printers in this group, the FS-400 sticks out in one important respect. It does not use GDI technology, but instead relies on the traditional printer architecture. In design, this printer is a simple cube-shaped block with a 100-sheet draw at the front for input paper. Output is delivered on the top of the machine which works reasonably well, but stacking gets precarious after about ten sheets.

The driver supplied with this printer gives no bi-directional feedback, so any processing problems must be dealt with in the old-fashioned way from the control panel on the printer itself. There's an "attention" indicator which lights up when something has gone wrong, accompanied by a garbled message on the LED such as "Opt. I/F Error ##". If you lose your manual, you're stuffed!

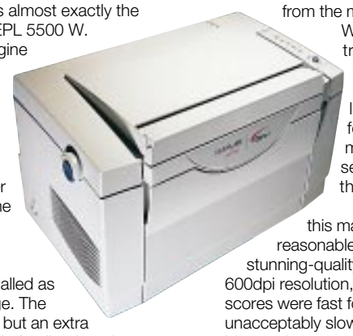
Under test, this printer's 300dpi quality was surprisingly good. The resolution is beefed up to 300 x 1200dpi using Kyocera's Image Refinement technology, making a noticeable difference to text and graphics, but photographic images were still lacklustre and dogged by fine banding. For speed, the FS-400 performed reasonably well on text, but bitmap and graphic images were unbearably slow. There's only 1Mb of memory installed as standard, expandable to 5Mb using industry-standard SIMMs.

PCW Details

Price £310 (street)
Contact Kyocera 01734 311500
Good Points Neat design. Good upgradability options including an extra paper tray, PostScript, and an Ethernet interface.
Bad Points Very slow.
Conclusion Old-fashioned technology. Difficult to operate.
★★

Lexmark Optra E

This Lexmark has been around for about a year now. It's a 6ppm budget printer and looks almost exactly the same in design as the Epson EPL 5500 W. Both printers use the same engine made by Minolta and both use the same consumables, with the drum and toner cartridges being interchangeable.



Setting up was pretty simple because the whole of the top of the box opens up revealing the machine's innards: everything is clearly visible. The input and output paper trays fold out from the bottom and top of the main box, and the machine design is generally quite compact.

The technology used is based on the traditional design, with 1Mb of memory installed as standard and PCL5e as the printer language. The basic driver provides no bi-directional help, but an extra utility called MarkVision is bundled to provide feedback to the user. This software is the same that is now shipped with Windows NT 4.0 and it worked well under test, producing accurate status information from the machine.

When printing from native DOS applications, troubleshooting must be carried out in the old-fashioned way using the control panel on the machine itself. This consists of six indicator lights and one button and is fairly self-explanatory for simple problems such as paper jams or loading more paper, but those involving various sequences of flashing lights are explained in the manual.

Under test, this machine produced reasonable, but not stunning-quality results in 600dpi resolution, and performance scores were fast for text but unacceptably slow for graphic and bitmap documents.

PCW Details

Price £365
Contact Lexmark 01628 481500
Good Points Nice, compact design.
Bad Points Slow for bitmap and graphic images.
Conclusion Overpriced.
★★

p161 ➢

NEC SuperScript 860

Personal Computer World Highly Commended

NEC was one of the first printer manufacturers to bring GDI technology to market. The first example was the SilentWriter SuperScript 610, a personal budget laser; this has now disappeared from NEC's range without a replacement model. Instead, NEC has launched the SuperScript 860, a slightly higher-end 8ppm printer with true 600dpi resolution.

Like the model from Brother, this printer uses a combination of GDI and traditional technology which allows it to take advantage of GDI code direct from Windows as well as being able to print from native DOS. Unlike the pure GDI printers, it has its own memory and internal electronics.

The driver provides accurate bi-directional feedback and there's a status monitor which sits permanently on your task bar showing the printer's current actions. The driver is an impressive piece of software incorporating Adobe Print Gear *(see page 164)*.

Documents can be tiled so that a single A4 page is magnified over four or six pages. It's also possible to reduce the size of documents, thereby creating A5-size booklets.

In design this printer is not exactly a space-saving option and its large, flat footprint really demands a desk of its own. Also, its fast print speed makes it capable of supporting larger workloads, attached either to one PC or to a small network.

Under test, the SuperScript 860 was stunning both in performance and output quality, putting it way in front of any other printer included here. Its street price is around £360, more expensive than most of the personal lasers included here and aimed at a slightly higher-end market, but still representing extremely good value for money.

PCW Details

Price £360
Contact NEC 01753 831944
Good Points Fast. Stunning quality.
Bad Points DOS printing using LaserJet IIP emulation achieves only 300x300dpi.
Conclusion Bargain.
★★★★★

OkiPage 4W

This budget LED printer is one of the smallest in this round-up, measuring about the size of a biscuit tin. It's a GDI printer and was launched in June 1996 claiming to produce 600dpi "class" resolution at four pages per minute. The resolution is actually achieved using Oki's MicroRes technology which electronically produces dots in between the LEDs. Technically, this is not true 600dpi resolution, but it produces better results than some of the edge enhancement techniques used in some of the 300dpi models included here.

Input and output trays both sit vertically towards the back of the box, so each sheet of paper in a print job goes through a tight u-bend. There is a straight paper path provided at the front of the printer for processing envelopes, card and other media. The driver provides a variety of templates for envelope printing which are placed straight into the Page Setup of your application software.

The driver also provides bi-directional feedback, responding appropriately when the paper or toner have run out. Like other GDI printers here, this one provides HP LaserJet IIP emulation for printing from a DOS box in Windows. Documentation is provided by three manuals in six different languages — not ideal for the first-time user.

Output quality on text was excellent under test but photographic images were slightly banded and patchy. As for the performance results, this printer proved much slower than expected despite the implementation of data compression techniques designed to speed up the printing process. The main advantages of this printer are its size and price. Otherwise, there's nothing that really distinguishes it from the crowd.

PCW Details

Price £220 (street)
Contact Oki 01753 819819
Good Points Small and light. Good for envelope printing.
Bad Points Slow.
Conclusion Nice driver software, nice price. Otherwise, unremarkable.
★★★

Panasonic KXP6100

This Panasonic has been on the market since March 1995, and its design was something of an innovation at the time. The KXP6100 is the ultimate space saver — a tall, upright machine with an input tray jutting out of the side of the body and an output tray leaning sideways from the top. It's also very portable, weighing just over 14lbs — a useful feature if you're likely to move your printer from one PC to another.

This printer was one of the original GDI models providing fast printing from Windows as well as PCL 4.5 emulation for printing out of a DOS box. It has a snooze mode where it powers down during periods of inactivity, and then springs to life on detection of the next print job. There's a slight delay while the printer warms up before producing the first sheet, a problem which some of the more recent models have now overcome. However, this printer's excellent scores on the performance tests show that the slight waiting period does not effect the overall "page per minute" figure.

The major downside of this model is its low resolution capability which is set at 300 x 300dpi. Beware of the advertising blurb which claims that this printer achieves a 600dpi class resolution. "Class" is the operative word here, as the final result actually achieved is 300dpi with added edge enhancement technology. However, the results from our quality tests were quite respectable for text and documents using simple graphics. On close inspection, photographic images displayed slight horizontal ridging. The bi-directional driver software responded well under test, and the documentation is sensibly uses jargon-free language to help the uninitiated.

PCW Details

Price £210 (street)
Contact Panasonic 0550 404041
Good Points Fast. Space-saving design.
Bad Points Room for improvement on the dpi level.
Conclusion Despite a few niggles, it's still an absolute bargain.
★★★

p163 ➢

Sharp JX-9210

Personal Computer World Highly Commended

This Sharp model, like the Canon, uses Microsoft's Windows Printing System, a standard developed by Microsoft to create a universal architecture for GDI printers. Not all GDI printers are developed in collaboration with Microsoft, but as the technique has become more popular, there's been an increasing need for standardisation.

In terms of design, this printer has several advantages over Canon's model. First, it stacks finished documents in a vertical paper tray, so the machine is self-contained and can sit neatly on the desk next to your PC without making a mess. Two antennae-like pieces of plastic at the back of the printer open out to form an input stacker which holds a maximum of 100 sheets.

The design of this Sharp demands a "u" shaped paper path which precludes the use of thick paper and card, so there's an alternative paper path provided by a flap at the bottom . When the flap is opened, output is automatically diverted to a straight path, with documents appearing face up at the front (another advantage over the Canon).

Setup and configuration is made easy by the WPS drivers which use bi-directional feedback, allowing you to perform a "test" print at the end of installation. Installing the cartridge is also a cinch as the whole of the printer's front panel opens out, allowing an easy view of the inside.

Results on the quality tests were excellent, with finished documents producing crisp 600dpi text from Windows.

Overall, this is a well-designed printer. The actual deskspace footprint is quite large, but it is nevertheless tastefully put together and good value for money.

PCW Details

Price £209 (street)
Contact Sharp 0161 205 2333
Good Points Well-designed. Excellent output quality.
Bad Points Slow.
Conclusion Good all-rounder for a small or home office. Nice price.
★★★★

Star WinType 4000

Star's WinType 4000 is tank-like in design with winged paper trays folding out from its top on the left and right. It's a heavy printer weighing a massive 16.5lbs, and it's hardly a space-saving option if you're working in a cramped environment.

This model was launched in December 1994 and, in many ways, it is now showing its age. Its resolution capability, for example, is still 300dpi. This is improved with edge enhancement technology to 300 x 600dpi, which makes a big difference to text quality, but photographic images still appear grainy, lacking the smooth grey tones achieved by true 600dpi models.

During setup, this printer caused some initial problems. The driver behaved erratically, causing errors in Windows 95 and refusing to provide any bi-directional feedback. Further investigation revealed that the driver sent with the printer was an old version. Its replacement greatly improved things and feedback from the printer to the machine began to work correctly.

Printing can be achieved in three modes on this model: GDI, PCL4, and PS (levels 1 and 3). This sounds impressively versatile, but the WinType 4000 is a GDI printer providing PCL4 emulation from a DOS box only, and PostScript printing via emulation software supplied with the printer.

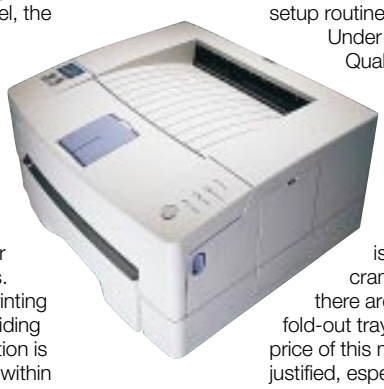
Unfortunately, both performance and quality tests were plagued with erratic paper-feeding problems, and performance results were poor considering the lower resolution of this printer compared to others included here. In fact, it's difficult to think of anything positive to say about the WinType 4000. Its inferior resolution capability combined with its cumbersome box size put it out of the running for any recommendations in this round-up.

PCW Details

Price £220 (street)
Contact Star 01494 471111
Good Points PostScript emulation software is a useful facility.
Bad Points Bulky design. Paper-feeding problems. Mediocre output quality.
Conclusion Unimpressive.
★

Tally T9108

"Mannesmann Tally" has now become "Tally", after the company was bought out by Legal and General Ventures in July 1996. This model, the T9108, pre-dates the name change, so it's still got "Mannesmann" written on its side and on all the documentation.



This printer is simple in design, just a cube-shaped box with an input tray in the form of a draw at the bottom , and output being deposited into a paper tray indented into the top of the box. There's also a manual feed slot at the front of the printer for processing transparencies, labels and cards.

The T9108 is designed as a Windows Printing System machine complete with drivers providing bi-directional feedback, and PCL 4.5 emulation is provided for printing from DOS applications within Windows.

Setting up was fairly hassle-free. A lid opens out at the front, and the developer cartridge slides easily into the printer's body. Documentation is thorough, and a Quick Reference Guide explains the setup routine in simple language with the help of illustrations.

Under test, this machine performed somewhat erratically. Quality results produced at 600dpi were impressive for all file types including photographic images, but speed was a problem. Considering this printer claims a raw engine speed of eight pages per minute, performance scores were poor, especially on bitmap and graphic images.

Generally, this printer behaved itself well, and there were no problems with paper jams or stacking. The straightforward design is well-suited to cramped environments, as there are no protrusions or fold-out trays. However, the high price of this model is not really justified, especially when considering its poor performance results.

PCW Details

Price £349
Contact Tally 0118 978 8711
Good Points Neat design.
Bad Points Poor performance scores.
Conclusion Overpriced.
★★

p164 ➢

Page description languages

In 1985 Adobe announced PostScript Level 1, arguably the first page description language to work with device-independent vector information *(see page 176)*.

PostScript Level 1 appealed to the high-end publishers thanks mostly to the fact that proofs made on a 300dpi laser would be laid out identically to those on 2400dpi image setters used to make film.

High-end publishing features coupled with graphics snobbery, particularly on the Mac, and the fact that Adobe is the only official licensor, made PostScript-equipped devices ultimately desirable and consequently expensive.

Hewlett-Packard saw a gap in the market and came up with its own device-independent-*ish* page description language based on its Printer Command Language, PCL, of the seventies. Skipping through the evolutionary process to the recent PCL 5e, developed for the LaserJet 4, sees a similar feature set to PostScript.

HP's marketing has been entirely different to Adobe's, opting for the mass cloners rather than the exclusive licensing. Similarly to the IBM AT concept, there are now many printers equipped with clones of PCL 5e costing much less than their PostScript-licensed counterparts.

The problem with having so many PCL clones around is that you cannot guarantee 100 percent identical prints on all printers. This is not a problem unless you intend use high-resolution bureaux and want an exact proof before you send files. Only PostScript can offer you a complete guarantee.

PostScript Level 2, released a few years ago, offers device-independent colour, data compression for faster printing, and improved halftone algorithms, memory and resource management.

Adobe announced PostScript Level 3 at the end of September 1996 and expects equipped printers to be available in early 1997. Details were limited at the time of going to press, but included inevitable references to the internet.

The printing world was shocked by Adobe's first quarter 1996 results. It was revealed that from the second half of 1997, Hewlet- Packard will not incorporate Adobe PostScript software in its LaserJet printers. From that time on, HP will offer PostScript-compatible printers using clone software, although end-users will still be able to buy and fit official Adobe PostScript SIMMs from third parties.

HP believes its own printer control languages are sufficient for the typical office environments where it sells in volume. Adobe's results came just one month before HP's own announcement of its latest printer control language, PCL 6. To be first implemented on the forthcoming LaserJet 5, 5N and 5M workgroup printers, PCL 6 is a complete rewrite, using object-orientated code. The more efficient code, combined with faster processors and dedicated hardware acceleration of these new LaserJet 5 printers, results in time-to-first-page speed increases of up to 32 percent over the LaserJet 4(M)+ printers they replace.

Licensing PostScript software to HP LaserJet products alone accounted for approximately five percent of Adobe's $762.3 million 1995 revenue. Adobe is fighting back at PCL with its brand new PrintGear technology, designed specifically for the lucrative small and home office (SoHo) market.

Adobe discovered that 90 percent of typical SoHo documents can be described by a small number of basic objects. Adobe consequently designed a dedicated 50MHz image processor to specifically handle these RISC-like tasks, which is claimed to offer large speed increases over traditional printer processors and be cheaper, too.

A printer equipped with Adobe PrintGear, such as NEC's SuperScript 860 reviewed here, features the dedicated processor and a sophisticated software driver, and offers options including tiling, up to 16 thumbnail pages per single sheet, two-sided printing, booklet printing and watermarking. Adobe PrintGear also supports DOS printing, and is suitable for colour printers and inkjets along with mono lasers.

Gordon Laing

GDI explained

Interestingly, the Windows graphical device interface, GDI, which scales and rasterises vector objects on-screen, could actually drive a printer by itself. However, a Windows GDI printer will operate under Windows only. No DOS printing, unless it's running in a Window, and then only with early PCL emulation.

There are many advantages to a GDI printer. The first and most obvious is the time saved by not converting the GDI information into an emulation such as PostScript. The second is one of cost. Traditionally, the printer would have a whole load of in-built electronics to process the description into dots. Rasterisation of the GDI information takes place within the PC, resulting in a cheaper printer.

GDI technology has brought the price of lasers down considerably, but different printer manufacturers implement GDI technology in different ways, and this has caused some confusion over the advantages/disadvantages of the GDI approach. Of the 12 printers reviewed here, four use the Windows Printing System, a standard developed by Microsoft to create a universal architecture for GDI printers.

The Windows Printing System works slightly differently to the pure GDI model. It enables the Windows GDI language to be converted to a bitmap while printing; the basic idea being to reduce the heavy dependence of the printer on the PC's processor. Under this system, the image is actually being rendered during the printing process which greatly reduces the amount of processing power required from the PC.

Gordon Laing & Eleanor Turton-Hill

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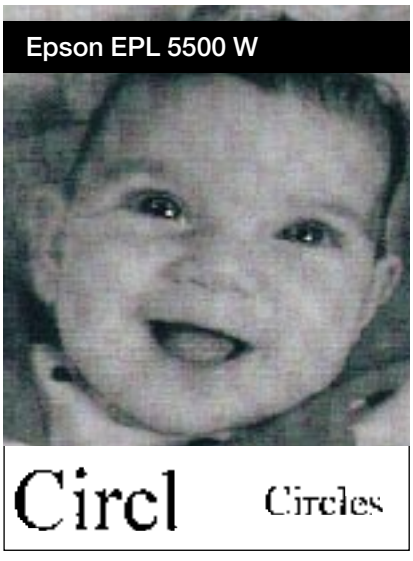
LASER PRINTER QUALITY TESTS

Brother HL 730

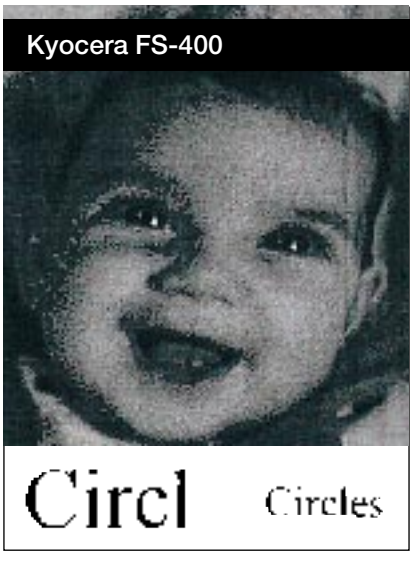
Canon LBP-465

Epson EPL 5500 W



HP LaserJet 5L

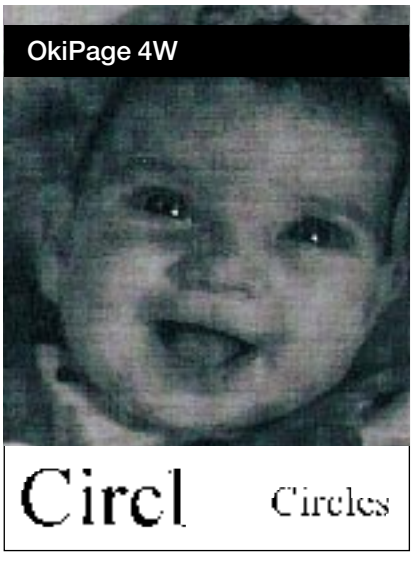
Kyocera FS-400



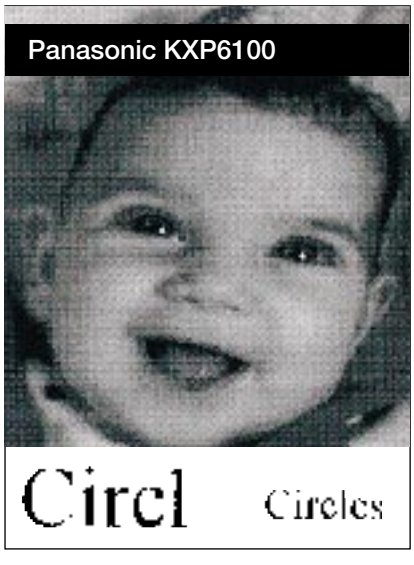
Lexmark Optra E

NEC SuperScript 860

OkiPage 4W



Panasonic KXP6100



p168 ➢

LASER PRINTER QUALITY TESTS

Quality of output

Several factors have an influence on the quality of your output, but the major one is the resolution capability of your printer. Until recently, 300dpi (dots per inch) was the best you could expect from an office printer, but now the market is littered with 600dpi printers. These will give you significantly better results, particularly when printing scanned images or graphics. At 600dpi, four times the number of dots are produced per inch of paper, resulting in a smoother tone gradation and a final image which looks pretty much like a black-and-white photograph.

Another factor which will affect the quality of your printer output is the use of edge enhancement techniques. These are used by some 300dpi laser printers to adjust the arrangement of dots on the page, so that stepped edges are smoothed out, making the resulting print appear to have a higher resolution. This works by modulating the power of the laser to fill in the dots at the edges of characters with smaller dots, so as to produce crisper-looking text and smoother images. This is worth looking out for in the lower-end 300dpi models but remember to compare the price with a true 600dpi printer — the price margin between the two is now negligible.

Paper

High-resolution printers are all well and good, but the quality of their output is restricted by the quality of paper you use. The jagged edges of unenhanced 300dpi print are visible when using ordinary copier-grade bond paper. At 600dpi or enhanced 300dpi, the quality improves, but any higher resolution than this will not be noticed unless you invest in a higher quality of paper.

Having said all this, laser printers are not affected by paper quality to the same extent as inkjet printers. The way that inkjets fire ink directly at the paper means that poor-quality absorbent paper leads to visible feathering of characters. On laser printers, the print quality never suffers quite to this extent, but smoother paper will noticeably improve resolution especially when using very high dpi levels.

Using poor-quality paper does have other side effects when used in laser printers. The drum inside the printer can become scratched, rapidly wearing out the surface and leading to deterioration in print quality and, ultimately, replacement of the drum. Follow the manual's guidelines as regards paper quality and weight, which is usually recommended as 75g copier paper which costs about £2.50 for 500 sheets. Higher-quality paper at 80 or 90g costs more than twice this amount for a smoother print.

The way that paper is stored is also quite important, as extreme heat or humidity can affect the way in which it feeds through the printer. Curled or damp paper soon causes paper jams and seizes up the system.

There are other considerations when it comes to paper. If you do a lot of printing on heavyweight paper or card, then you should take note of the way that the paper passes through the printer. The normal paper path involves turning the sheet through an S-shaped bend, but many lasers include a straight-through path which prevents the paper from curling as it travels through the machine. Others provide an envelope feeder which will allow you to stack and feed multiple envelopes so that you don't have to manually feed them one at a time.

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Table of Features

Personal Computer World Editors Choice

Manufactuer	Brother	Canon	Epson	Hewlett-Packard	Kyocera	Lexmark
Model name	HL-730	LBP-465	EPL 5500W	LaserJet 5L	FS-400	Optra E
Street price	£270	£299	£245	£286	£310	£365
Tel no	0161 330 6531	0121 680 8062	0800 289622	0990 474747	01734 311500	01628 481500
Fax no	0161 931 2205	0121 693 5070	01442 227227	0171 735 5565	01734 311108	01628 481886
Warranty	12 months (OS)	12 months (OS)	12 months (RTB)	12 months (RTB)	12 months (RTB)	12 month (OS)
Technical Features						
True DPI level	600	600	600	600	300	600
PCL level	4	4*	4*	5e	5	5e
GDI/WPS	GDI	WPS	WPS	None	None	None
Native DOS printing	Yes	No	No	Yes	Yes	Yes
Standard memory	0.5Mb	256	0.5Mb	1Mb	1Mb	1Mb
Maximum memory	2Mb	N/A	N/A	9Mb	5Mb	5Mb
Size in mm (w x h x d)	366x250x353	336x249x319	352x217x407	336x371x312	353x173x350	348x298x378
Weight	14.3lb	15.4lb	11.0lb	15.7lb	16.6lb	11lb
Raw engine speed	6ppm	4ppm	6ppm	4ppm	4ppm	6ppm
Paper Handling						
Input capacity	200	100	150	100	100	150
Output capacity	100	no output tray	100	100	100	100
Manual paper path	Yes	Yes (mp tray)	Yes	Yes	Yes	Yes
Interface options						
Apple LocalTalk	Yes	No	No	No	Yes	No
Ethernet	Yes	No	No	No	Yes	Yes (external box)
Serial port	Yes (optional)	No	No	No	Yes	Yes

Table of Features

Personal Computer World Highly Commended

Manufacturer	NEC	Oki	Panasonic	Sharp	Star	Tally
Model name	SuperScript 860	OkiPage 4W	KX-P6100	JX-9210	WinType 4000	T9108
Street price	£360	£220	£210	£209	£220	£349
Tel no	0645 404020	01753 819819	0500 404041	0800 262958	01494 471111	01734 788711
Fax no	0181 235 4927	01753 819899	01789 200290	0161 205 7076	01494 473333	01189 791491
Warranty	12 months (RTB)	12 months (OS)	12 months (OS)	12 months (RTB)	12 months (OS)	12 months (OS)
Technical Features						
True DPI level	600	300	300	600	300	600
PCL level	4	4*	4.5*	4*	4*	4.5*
GDI/WPS	GDI	GDI	GDI	WPS	GDI	WPS
Native DOS printing	Yes	No	No	No	No	No
Standard memory	1Mb	128Kb	256Kb	512Kb	256Kb	1Mb
Maximum memory	4Mb	N/A	N/A	N/A	N/A	16Mb
Size in mm (w x h x d)	370x125x382	310x150x191	132x287x378	299x185x291	235x330x265	360x176x364
Weight	19.8lb	8.4lbs	14lbs	10lbs	16.5lbs	19.8lbs
Raw engine speed	8ppm	4ppm	6ppm	4ppm	4ppm	8ppm
Paper Handling						
Input capacity	200	100	100	100	100	150
Output capacity	50	30	50	50	50	100
Manual paper path	Yes	Yes	Yes (mp tray)	Yes	Yes (mp tray)	Yes
Interface options						
Apple LocalTalk	No	No	No	No	No	no
Ethernet	No	No	No	No	No	Yes
Serial port	No	No	No	No	No	Yes

Key: * PCL emulation from a DOS box in Windows only
RTB Return To Base
mp tray Multipurpose input tray
OS On Site

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Laser printers and the environment

Laser printers have always been unenlightened creatures when it comes to environmental considerations. They churn out nasty gases, use up lots of power and periodically spit out used cartridges which are dumped in landfill sites.

The technology used in laser printers makes ozone an inherent byproduct of the printing process. Some printers contain filters which are designed to limit ozone concentration to levels below standards which have been established by various bodies such as the American Conference of Governmental Industrial Hygienists. After a certain number of pages have passed through your printer (usually about 150,000) the filter should be replaced by an authorised service engineer. The ozone level emitted by your printer can be affected by where and how you keep it. Areas with large concentrations of dust, small, enclosed offices or poorly-ventilated rooms will result in high ozone intensity.

Power-saving abilities are also becoming important in laser printer design. An independent US body, the EPA, has stipulated that, in order for a printer to gain Energy Star Compliance, it must dramatically reduce its power consumption when not being used. The power saver usually works by only warming up the printer when you send a job to it. If the printer is left idle for a certain period of time, the printer's power consumption is reduced. This period of time can usually be altered by the user, and if you are in a real hurry to print the first page more quickly, the power saver can be turned off altogether.

Laser printers produce radiation and often claim to conform to Class B limits, which means they satisfy European safety standards. What this means is that there is never any human access to radiation above a prescribed level during normal operation. Normal operation includes any kind of user maintenance carried out according to directions in the manual, and there is usually a serious warning somewhere in your printer documentation reminding you that anything you do with your printer outside of these boundaries may result in hazardous radiation exposure.

Most lasers use cartridge technology based on an organic photoconductive (OPC) drum which is coated in light-sensitive material. During the lifetime of the printer, the drum needs to be periodically replaced as its surface wears out and print quality deteriorates.

The cartridge is the other big consumable item in a laser printer. Its lifetime depends on the quantity of toner it contains. When the toner runs out, the cartridge is replaced. Sometimes the toner cartridge and the OPC drum are housed separately but, in the worst case, the drum is located inside the cartridge. This means that when the toner runs out, the whole drum containing the OPC cartridge needs to be replaced, which adds a considerable amount of money to the running costs of the printer and produces large amounts of waste.

Some printer manufacturers have tried to improve this situation by making drums more durable and eliminating all consumables except for toner. Kyocera, for example, has produced a "cartridge-free" printer which makes use of an amorphous silicon drum. The drum uses a robust coating which lasts for the lifetime of the printer, so the only item requiring regular replacement is the toner — and even this comes in a package made from a non-toxic plastic designed to be incinerated without releasing any harmful gases. The Kyocera FS-400 reveiwed here *(page 157)* uses a long-life drum which lasts for 100, 000 pages — about four times the lifetime of other drums in personal lasers.

The idea behind Kyocera's design is to make savings in the running costs of the machine. The point is that if you want a printer for heavy office use, it may be worth your while spending slightly more initially in order to save money in the long-term. The running costs of a laser printer can be considerable, and it is worth looking into this before investing your money in something which superficially looks like good value.

Eleanor Turton-Hill

Some printers produce more waste than others, so consider toner and cartridge replacements when buying

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Mechanics: how a laser printer works

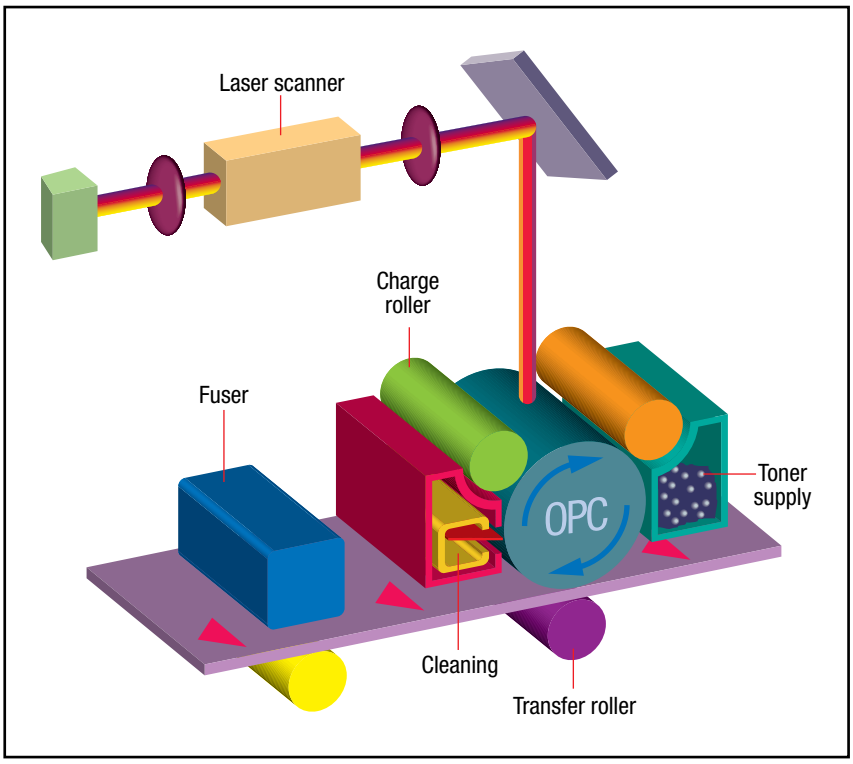
It is important to realise that a laser printer draws a dot at a time, moving down one line at a time like a TV picture: it cannot back up on itself. The printer has to decode the whole page description before it can start printing. With the whole page in memory, the mechanical process can begin.

The laser is used to draw on a photocopier drum. It takes the image from the memory and, as it tracks from left to right, the laser is turned on and off. Moving the whole laser would be a major mechanical task and is unnecessary. All that has to be moved is the light, and this can be done with mirrors. The printer has a small eight-sided drum and as this spins, the laser tracks across the photocopier drum. You can see a similar principle if you look at a mirror ball at a disco. The lights bounce off the ball onto the floor, track across the floor and disappear as the ball revolves. In the printer, the mirror drum spins incredibly fast and is synchronised with the laser turning on and off. A typical laser printer will have to perform millions of switches every second.

LED printers are a cheaper alternative to conventional lasers, where the single laser and directing mirror are replaced by a fixed line of LEDs. A 300dpi LED printer will have 300 LEDs per inch, over the required page width; if eight inches is the printable width for a typical A4 LED printer, that would total 2,400 LEDs in a row.

The advantage is that a row of LEDs is cheaper to make than a laser and mirror with lots of moving parts. The disadvantage is that the horizontal resolution is absolutely fixed, and while you can apply some resolution enhancements, none of them will be as good as the possible resolution upgrades offered by some true lasers, described earlier. This aside, LEDs effectively work as lasers and from this point on in the text, both will be referred to as lasers.

The laser works like a stick drawing in dirt; the dirt is a static charge on the drum. Where the laser is turned on, it hits the drum and knocks the charge off. Where it is turned off, the charge remains. Inside the printer, the drum rotates to build one line at a time; clearly, this has to be done very accurately. The smaller the rotation, the higher the resolution of the printer down the page. Similarly, the faster the beam is turned on and off, the higher the resolution across the page. An on-off switch is much easier to engineer than an accurate step, so resolution enhancement using this technique will only improve the horizontal resolution, and then only on true laser printers.



As the drum rotates to present the next area for laser treatment, the written-on area moves into the laser toner. Toner is a very fine dust, usually jet black for traditional monochrome printing but available in cyan, magenta and yellow for colour printing. The image builds up on the drum as the toner is attracted to it. As the drum rotates, it is pressed against the printing paper which is fed in by a set of rubber rollers. The toner rubs off onto the paper, but a page of dust isn't going to last long, so the paper passes under a heated roller to melt the toner on.

Toner is specially-designed to melt very quickly. If you spill some, you should not try to clean it with hot water or you will make a worse mess. Cold soapy water is best. A vacuum cleaner is a very bad idea because the toner is finer than the holes in the cleaner bag and you end up spreading the fine dust. Most modern printers build the drum and the toner into a sealed cartridge so you shouldn't need to mess with the powder.

The page, having been smeared with toner and heated, then slides out of the printer. The drum rotates and has to be cleaned. There are two forms of cleaning, physical and electrical. With the first, the toner which was not transferred to the paper is mechanically scraped off the drum and the waste toner collected in a bin. Electrical cleaning takes the form of covering the drum with an even electrical charge so the laser can write on it again. This is done by an electrical element called the corona wire. Both the felt pad which cleans the drum and the corona wire should be changed regularly.

Refilling cartridges is a good way to save money, but the cleaning pads will wear the drum and you cannot expect the same quality as you get with a new drum. Some manufacturers only guarantee their machines and high-quality output when you're using their own brand of toner, such as Hewlett-Packard's Microfine toner for its 600dpi lasers.

Gordon Laing

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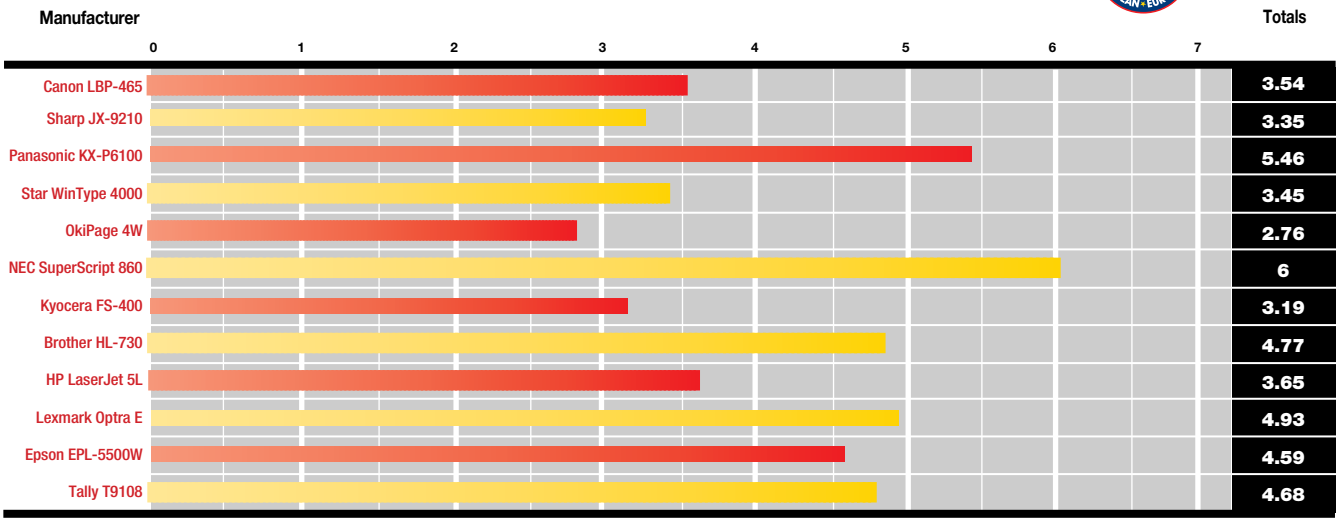
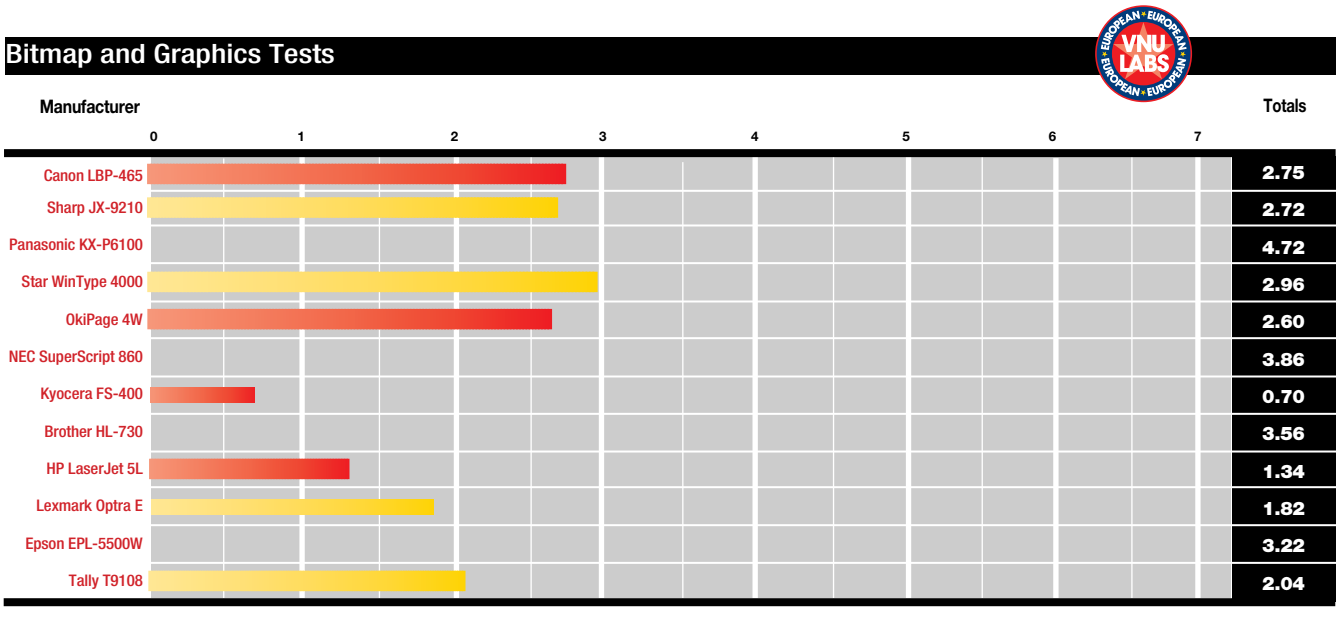
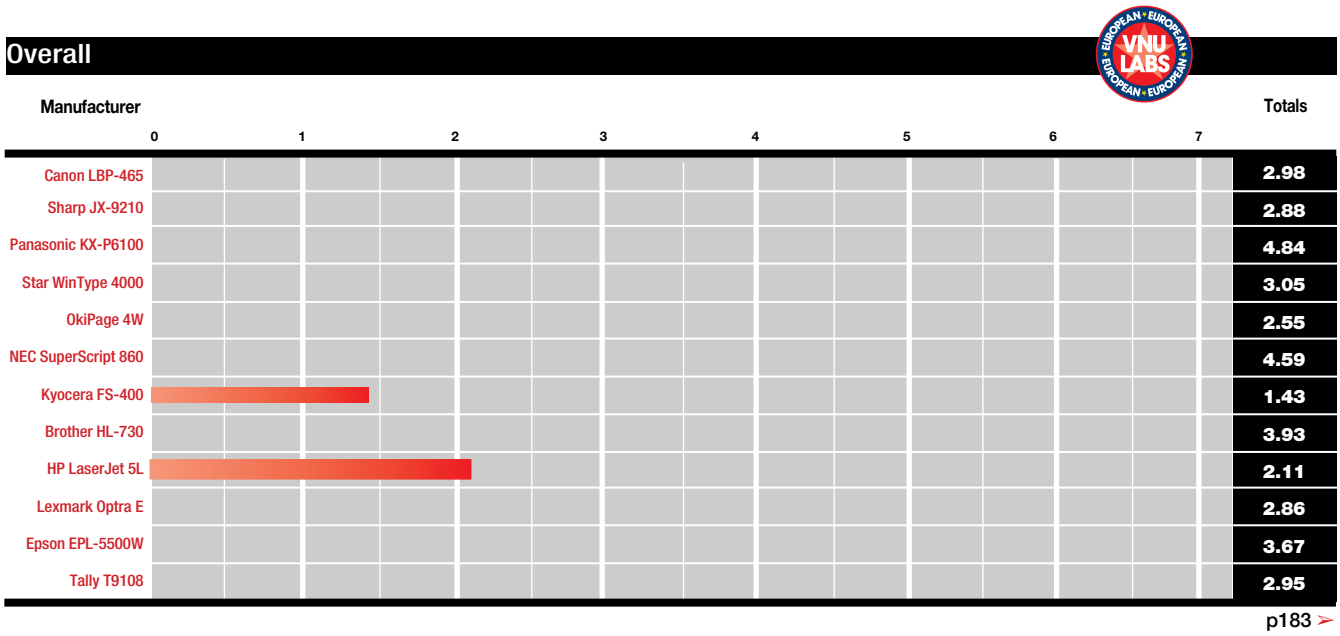
Text Tests



Bitmap and Graphics Tests



Overall



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VNU Labs Report

This laser printer round-up has differed from previous years for one good reason: there's been a general drift towards Windows 95 since the last laser test — and that means that many printer drivers have altered significantly. More models than ever are using the Windows Printing System, or other non-Microsoft adaptations of the earlier Destiny GDI system for printing under Windows. For these reasons, the old Windows 3.11 printer tests have needed a certain amount of reworking for this feature.

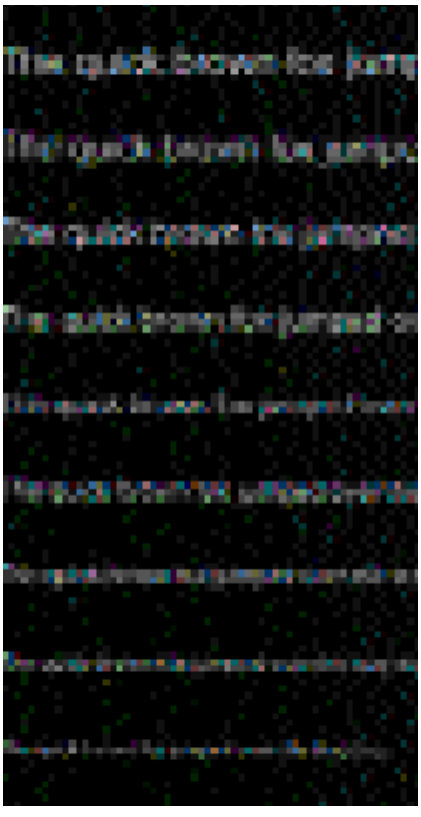
The basic performance-testing files used have not changed much since the previous incarnation of the tests: a gauge of text-printing speed for simple documents is obtained by sending ten copies of a five percent covered page in plain ASCII through the printer driver from Windows. Graphics speed has always been easy to measure accurately, but harder to explain. Most images from graphics programs like CorelDraw and PowerPoint are broken down into both vector-based and bitmapped components for printing. Printing an arbitrary graphical image will produce a speed figure that tells you little of the printers' comparative strengths and weaknesses. VNU Labs tests send both a "pure" bitmap and a vector file to the printer, so as to pick out any printers that are especially poor at either kind of graphical processing. Outstanding results are noted in individual reviews: the graphed figures for graphics performance are weighted geometric mean figures including both tests.

Quality measurement pages, containing a succession of stepped line squeeze tests, graduated greys (the nearness-to-black test), diminishing font sizes, and photographic images printed in both normal and inverse (black background and white figure) are sent to each of the printers from reference PostScript files, using the printers' supplied drivers. The PostScript files are read into CorelDraw for printing. This is one major difference between the updated and previous printer tests. The previous incarnation of the print quality test required a PostScript interpreter like GhostScript or ZScript in order to turn the test files into hardcopy output. Both of these programs are often found to conflict with certain Windows printing system drivers under Windows 95.

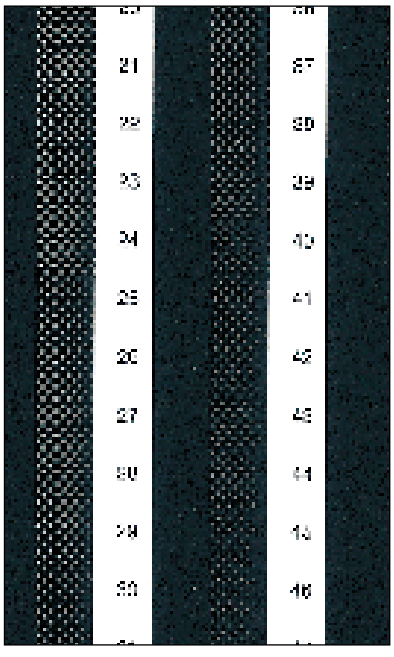
One noticeable change in low-cost laser printers is that much of the processing load is carried by the host PC. An IBM PC model 340 is used throughout as the driving system for the printer tests. Its specifications are as follows: P5 133MHz CPU, 16Mb RAM, Windows 95 installed on primary partition.

Overall performance scores are obtained from both overall graphics and text speed figures, using a weighting of 1.3:0.7. This reflects the fact that much printing nowadays includes complex typefaces and "incidental" graphical content. But this is not true of everybody's printing habits, so you should also read the individual scores and match the textual and graphical benchmarks against your own documents.

Julian Evans



The "nearness-to-black" test (below) assesses contrast of printed output. When printing inverse text (centre), this is vitally important



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Editor's Choice

Personal Computer World Editors Choice

It's almost three years since the first GDI printers appeared. The new technology had a massive impact on the printer market, bringing prices down and creating new competition between manufacturers. NEC's SilentWriter 610 was one of the first of this new breed of printer using Graphical Device Interface code direct from Windows. The technology has been developed and refined since NEC's original GDI laser, and in this round-up there's a whole variety of different implementations.

The traditional laser design still persists. Out of twelve printers included here, three have been built using traditional architecture: the Kyocera FS-400, the HP LaserJet 5L and the Lexmark Optra E. Instead of taking GDI code direct from Windows, these three printers use a printer control language. They have their own internal electronics and memory and are not dependent on the host PC for processing. Because these printers are not using Windows GDI code, they can print from native DOS applications. The downside of the design is its poor performance on bitmap and graphics files which shows on our test results.

GDI offers many advantages over the traditional model and there are many good technical reasons for its use. Windows provides all the software mechanisms required to display text using all manner of different fonts, typestyles, sizes and orientations, as well as displaying bitmap and vector graphics. Using GDI code direct from Windows, the intermediary translation process which most printers use is cut out of the printing process. This speeds up the printing considerably. For manufacturers, the great advantage of the GDI printer is that it is less complex and, more to the point, cheap to manufacture. It uses the sophistication of the machine already on your desk rather than incorporating intelligence of its own.

Early implementations of GDI technology had their disadvantages, the main one being their heavy dependence on the host processor. In this architecture, the GDI language is converted into a bitmap on the computer, and the bitmap is then sent to the printer. The speed of a print job in this case depends upon the speed of the processor. A fast processor will produce fast printing, but the reverse is also true. Of the printers included here, the OkiPage 4W, the Panasonic KX-P6100 and the Star WinType 4000 still use this early technology, which explains their incredibly low street prices. If you have a reasonably powerful PC (at least Pentium class) with enough RAM (preferably 16Mb minimum) your system will be largely unaffected by this resource dependence, in which case such early GDI models represent an excellent deal. Of the three reviewed here, the Panasonic KX-P6100 is the best design and produced excellent scores on our performance tests. Bear in mind that it is limited to a resolution of 300dpi and is not capable of printing from native DOS applications.

Other GDI printers here use the Windows Printing System which works differently from the process described above. It enables the Windows GDI language to be converted to a bitmap while printing. Under this system, the image is being rendered during the printing process which reduces the amount of processing power required from the PC. These printers are slightly more expensive than the pure GDI designs but use your resources more efficiently and offer higher 600dpi resolution.

Of the four WPS printers reviewed here, the Sharp JX-9210 is the one that excels, offering the best value for money. For this, it wins a Highly Commended award. Its compact design combined with its excellent 600dpi-quality output put this printer head and shoulders above other WPS lasers. At the time of writing, we found street prices as low as £209.

When it comes to technical innovation, there are two printers in this round-up which deserve special mention: the NEC SuperScript 860 and the Brother HL730. Both models use a combination of traditional design and GDI technology, providing fast printing under Windows without sacrificing compatibility with native DOS applications. NEC's SuperScript 860 gets our second Highly Commended award. Having now dropped the original SuperScript 610 from its product range, the company has introduced this more powerful model with a raw engine speed of eight pages per minute, fast enough to support a small workgroup. A drastic price reduction at the time of writing put the SuperScript 860 down to £360, making it an excellent deal for the small business or workgroups.

The Brother HL-730 gets our Editor's Choice award in this year's laser printer group test. At a street price of just £270, the Brother provides six pages per minute raw engine speed with fast GDI performance under Windows, without sacrificing DOS or Macintosh compatibility. It also comes with a driver which is not just bi-directional, but also incorporates compression and memory management techniques enabling large files to be printed using a small amount of memory. The Brother HL-730 design offers the most innovative use of technology in this year's round-up.

High five

Adele Dyer sorts the fact from the hype as five PCs from high-street manufacturers compete on a bangs-per-buck basis.

You must have seen the ads. Intel's push for the consumer buck is now an annual event, luring the wary home user to part with his, or now more commonly, her hard-earned cash to buy a PC. It will, of course, have to have a Pentium inside that drives a CD-ROM drive so you can play Monopoly, and connect to the internet to play against anyone in the world. Meanwhile, Radio Rentals is urging you to invest in an Aptiva, and IBM is doing the same with its Japanese operating theatre advert.

We have taken five of the most common brands peddled on the high street and separated fact from hype. They do not conform to any strict criteria; they simply represent the most popular PCs these manufacturers produce. They are all well-powered machines with 16Mb of RAM and just about everything you could want to do at home bundled in. They all have V.34 modems and are all groaning with free software. Some have 3D graphics, some have sub-woofers and some even throw a joystick into the equation.

In other ways, however, they are very different machines, so we looked for the best overall value for money, taking into account the hardware and software bundles and the performance relative to the power of the machine.

PC Photography by David Whyte

Consumer PCs Contents

Apricot MS540

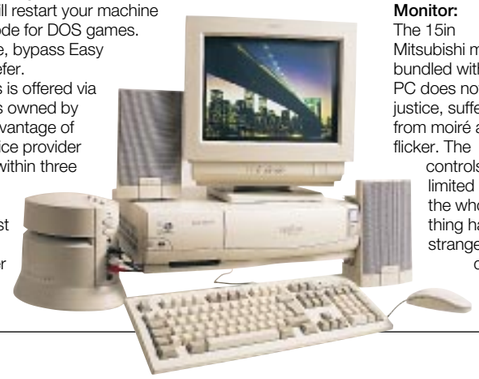
Personal Computer World Editors Choice

Apricot has completely rethought its strategy with this machine, breaking down the three main uses for the PC in the home as games, education and internet access. The hardware and software spec is therefore based strictly around these three.

The components are impressively comprehensive as the Apricot comes complete with the various parts of an AWE-32 sound card and a sub-woofer for blow-you-away sound, the ATI Rage 3D graphics chip and an internal V.34 modem. There are two USB ports. For the couch potatoes among you, there is a remote control.

The interesting part of the equation, however, is the pre-loaded Easy Manager II package which controls internet access, email, the power management features and the pre-loaded games and CD-ROM titles. For email, Easy Manager II provides the sole interface. It is the easiest email package I have seen, but some may find it feels a little toytown-ish. The games and CDs can be accessed via a launcher, which will restart your machine under MSDOS mode for DOS games. You can, of course, bypass Easy Manager if you prefer.

Internet access is offered via InfoTrade, which is owned by Mitsubishi. The advantage of choosing this service provider is you can set up within three clicks — the software is pre-loaded and you just have to fill in your alias, serial number and credit-card details.



To prevent theft, Apricot has added an impressive level of security. There is the normal password protection, but the BIOS is also branded to flash up who the machine belongs to on startup. A "Sensonic" screech alarm has been added, so if the machine is moved more than a predefined amount, an ear-piercing 100dB scream is let out.

The power management features are easy to set up and allow the machine to be put into what Apricot calls "deep green mode", i.e. all but powered off, but still ready to restart if a fax is received, or to activate the alarm if the machine is moved.

Monitor:
The 15in Mitsubishi monitor bundled with this PC does not do it justice, suffering from moiré and flicker. The controls are limited and the whole thing has a strangely dated feel.

PCW Details

Price £1,956.59 (plus VAT); £2299 (incl VAT)
Contact Mitsubishi Electronic PC Division 0800 7173549
Hardware Bundle Mitsubishi speakers, sub-woofer.
Software Bundle See features table *(page 192)*.
Warranty Terms Depends1 on supplier.
Technical Support In-Touch web site support. Telephone support dependent on supplier.
Good Points Security. Good sound.
Bad Points Dreaded riser card construction.
Conclusion A good machine both for beginners and more experienced users.
Software Bundle ★★★★
Build Quality ★★★
Overall Value ★★★★

AST Advantage! 7303

Personal Computer World Highly Commended

AST had one user in mind with the 7303 — the games player. The striking components in this PC compared to others in the AST range, therefore, are the sound and the graphics capabilities. Included in the deal on the sound front are a sub-woofer and speakers, which effectively provide 3D sound and are ideal for the immersive Doom experience. A Logitech Wingman Extreme joystick is bundled for gamers, while the 3D S3 ViRGE chip lets you get the most out of the new breed of 3D games.

The other element in this machine, as with all the consumer PCs we have seen this year, is the bundled internal modem. This is a Miro card which uses IBM's excellent Mwave chip. As a result, the bundled software is a good mix of comms, games, education and office applications.

Under the lid, AST has opted for the familiar riser card layout. For anyone who intends to upgrade their PC in future, this is a real pain to work around. The only slot to be filled is taken by the modem and one backplate is blocked by the sound connections, which in turn blocks one of the free PCI slots. Everything else is on the motherboard, including the Yamaha sound chip and the S3 graphics chips. However, this does not mean there are a vast number of free slots available, there being only one free PCI and one free ISA slot. Start filling these up with a SCSI card and a peripheral interface card, and you're in trouble.

Also on the motherboard are two USB (universal serial bus) connectors. These are separate, not placed one on top of the other as in other machines. AST is one of the few manufacturers to be implementing USB on its motherboards, along with Compaq, IBM and Apricot. Most motherboards have had USB capability built onto them for several months, but few manufacturers have had the courage of their convictions to implement the connection. The first USB peripherals are expected to arrive in this country in February.

Monitor:
Despite initial appearances, the monitor was actually quite good. It was set up to run at 800 x 600 non-interlaced at 60Hz and defaulted at 1,024x768 to run at 43Hz interlaced. The resulting flicker was appalling, but was quickly rectified by upping the refresh rate to 85Hz at 800 x 600 in 256 colours. However, the moiré was still shocking.

PCW Details

Price £1,799
Contact AST 0990 611611
Hardware Bundle LCS speakers, Wingman Extreme joystick.
Software Bundle See features table.
Warranty Terms Retailer specific.
Technical Support Free telephone and fax support.
Good Points Fast; great for a games player.
Bad Points Cramped inside.
Conclusion A very reasonable price for a good machine.
Software Bundle ★★★★
Build Quality ★★★★
Overall Value ★★★★

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Table of Features

Personal Computer World Editors Choice

Personal Computer World Highly Commended

Manufacturer	Mitsubishi Electric PC Division	AST	Compaq	IBM	Packard Bell
Model Name	**Apricot MS540**	**Advantage! 7303**	**Presario 4712**	**Aptiva 392**	**9005D**
Tel No	0800 212422	0990 611611	0990 134456	0990 727272	01753 831914
Fax No	0121 717 3549	01756 702888	1813323409		01753 832400
Price (incl VAT)	£2299	£1799	£2127	£2339	£1799
Basics					
Processor	Intel Pentium 166	Intel Pentium 133	Intel Pentium 166	Intel Pentium 200	Intel Pentium 133
PCI only slots	1	2	2	1	1
ISA only slots	3	2	2	6	2
Shared PCI/ISA slots	1	0	1	1	1
Motherboard	Mitsubishi	Intel Ruby	Compaq	IBM	Thousand Oaks
Chipset	Intel 430HX	Intel 430HX		Intel 430VX	Cirrus 5446
No. of 3.5in bays	2	3	1	4	1
No. of 5.25in bays	1	2	2	2	0
Hard disk size	2.5Gb	1.6Gb	2.5Gb	2Gb	1.2Gb
Hard disk interface	EIDE	EIDE	IDE	EIDE	EIDE
RAM and L2 Cache					
RAM supplied	16Mb EDO	16Mb EDO	16Mb EDO	16Mb EDO	16Mb EDO
Secondary cache (Kb)	256Kb Pipeline Burst	256Kb Pipeline Burst	❍	❍	256Kb Pipeline Burst
Price for 8Mb RAM upgrade	£70	£100	£75	Dependent on retailer	N/A
Price for 16Mb RAM upgrade	£140	£160	£145	Dependent on retailer	N/A
Multimedia					
CD-ROM manufacturer	Sony	Sanyo	Mitsumi	Various	NEC
CD-ROM speed	8X	8X	8X	8X	8X
Sound card manufacturer	Creative Labs	Yamaha	ESS	IBM	Packard Bell
Sound card model	SoundBlaster Vibra 16 + wavetable	OPL35A	ESS	IBM Mwave	Rocky 2.5
Graphics					
Graphics card	ATI 3D Rage	S3 Virge	Compaq	ATI 3D Rage	Cirrus Logic GD 543X
Graphics card RAM/max RAM	2Mb / 2Mb on board	2Mb DRAM	1Mb / 2Mb	2Mb / 4Mb	1Mb / 2Mb
Graphics card max refresh rate @ 1024 x 768 x 256	150Hz	85Hz	75Hz	150Hz	76Hz
3D capable?	●	●	❍	●	●
Monitor manufacturer	Mitsubishi	AST Vision	Compaq	IBM	Packard Bell
Monitor size (in)	15	15	15	17	14
Monitor maximum refresh rate at1024 x 768 (Hz)	60Hz	75Hz	75Hz	75Hz	87Hz
Other Information					
OS supplied	Windows 95	Windows 95	Windows 95	Windows 95	Windows 95
Office suite	MS Works or Lotus SmartSuite	MS Works 4.0	MS Works for Windows	MS Works,	Corel WordPerfect Suite
Games supplied	Actua Soccer (3D),	Descent II, Actua	PGA Tour 96,	Lotus Smartsuite 96	Eccho the Dolphin,
	Fade to Black,	Soccer, Omnimedia's	Magic Carpet	Mech Warrior II 3D,	Sim City Deluxe,
	Crusader No Remorse,	Greatest Toyshop on		Actua Soccer 96	Ciunet,
	Mech Warrior II (3D)	Earth, The Muppets,			Bridge, Checkers
		Dogz, Whiplash,			
		Quicken 5.0,	Quicken 4.0,	MS Encarta 96, World's	MS Works, Quicken 5.0,
Other software	MS Money, Mindscape	CompuServe, AOL	MS Encarta 96,	Greatest Monuments,	Corel 4.0, Encarta 96,
	PrintMaster Gold, AA		CorelDraw,	BodyWorks, Creative	MS Publisher, Asterix
	Days Out in Britain &		CompuServe	Writer, Caesar II, The	Learn French and
	Ireland, DiscoverWare			Lost Mind of Dr Brain,	Spanish, MS Money,
	Learn Windows 95, Words			Strategy Games of the	Elle 2000 recipes,
	& Madelaine, Hutchinsons			World, Battle Beast,	MS Oceans, Batman
	MM Encyclopedia 96,			Wall Street Money,	Cartoon Maker, Casper,
	Garden Designer II, Typing			Navigator 2.0, IBM	Comic Zone, Sammy's
	Tutor, Apricot free internet			Internet Connection	Science House, Soft
	access, Sesame Street			Phone, CompuServe,	Karaoke, Trudy's Time
				Communications Centre,	and Place, McAfee
				IBM Antivirus, Torrins	AntiVirus Scan,
				Passage, Audio Station	Thinkin Things 2
Speakers	Mitsubishi Electric speakers	LCS 1025 + bracket	JBL Pro	IBM	Packard Bell Phase II
Subwoofer	●	❍	❍	●	❍
Modem	V.34 modem	V.34 modem	33.6 fax modem	IBM 28.8 fax modem	Rocky 28.8 fax modem

● Yes ❍ No

p196 ➢

Compaq Presario 4712

Compaq has put some hard thought into the business of producing consumer PCs in the last couple of years. In 1995, it launched a separate division devoted to the home market, recognising it as a huge growth area. The resulting PCs are now looking quite impressive.

On first sight, one thing catches your eye — the buttons on top make you wonder if Compaq has built in some undreamed-of piece of hardware. In fact, they control the answer machine, speakerphone, audio CDs, sleep mode and the on-screen help. A light will flash if you have any new messages waiting on either email or on the answering machine. This is very much like Apricot and Packard Bell's remote control access, but the help button is especially useful — if you get into trouble, you simply have to hit one button.

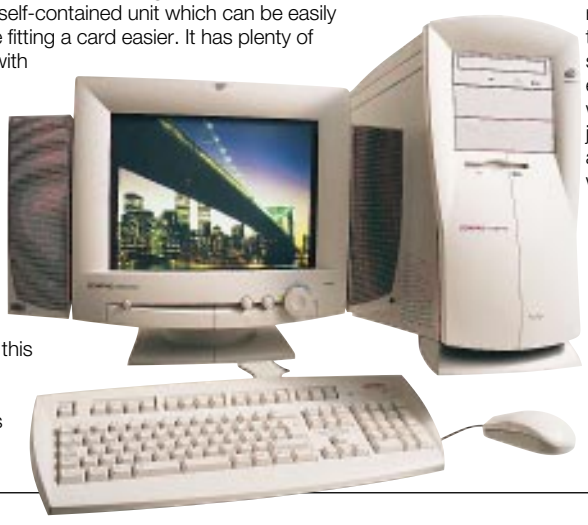
Inside, the build is also interesting. The riser card for the expansion slots is in a whole self-contained unit which can be easily pulled out to make fitting a card easier. It has plenty of expansion room, with two ISA only, two PCI only and one shared slot. All the sound connections are on the motherboard, so there is no need to lose a slot to a port card.

Compaq has two USB ports on this machine, and was in fact one of the first manufacturers to adopt the standard. Also ahead of the pack, the modem conforms to the V.34 extension and so has a top speed of 33.6Kbps.

In other ways, however, the Compaq is less glaringly up to date as other PCs in this test. Compaq is still using the old Triton chipset, not the newer Triton II, and if you want the performance gain of L2 cache, you will have to pay an extra £38 to get 256Kb. 3D graphics are offered on only one of its models; the video chip on most models is an S3 Trio 64+, hidden under a "Compaq component" sticker.

Monitor:

The Compaq's 15in monitor is quite acceptable. It is able to run at 1,024 x 768 with little moiré or bleeding, and is generally free from flicker. However, it does have one tiny drawback — it jumps about badly when it redraws the whole screen or even when it just draws a new window.



PCW Details

Price £2,127
Contact Compaq 0990 134456
Hardware Bundle JBL Pro speakers.
Software Bundle See features table.
Warranty Terms 1 year on site.
Technical Support Fax support.
Good Points Build quality, modem speed.
Bad Points No cache, hence less than impressive performance.
Conclusion Good machine, but expensive.
Software Bundle ★★★
Build Quality ★★★★
Overall Value ★★★

IBM Aptiva P200

The last time we saw an Aptiva, we weren't particularly impressed. Since then, IBM has made several improvements. The machine we review here is the model that will be in the shops this Christmas. In the New Year, it is due to be replaced by the new Stealth machines. For a sneak preview of these, see First Impressions *(page 70)*.

The most immediately-striking feature of this Aptiva is the new ATX motherboard. This has some flashy little touches, being able to switch itself off when you shut down the machine. There is also the Rapid Resume feature, which will put the PC to sleep if you leave it alone for too long. This feature is the same as the standby mode on notebooks and Apricot's "deep green mode", and is useful if you want to leave it on to receive incoming faxes.

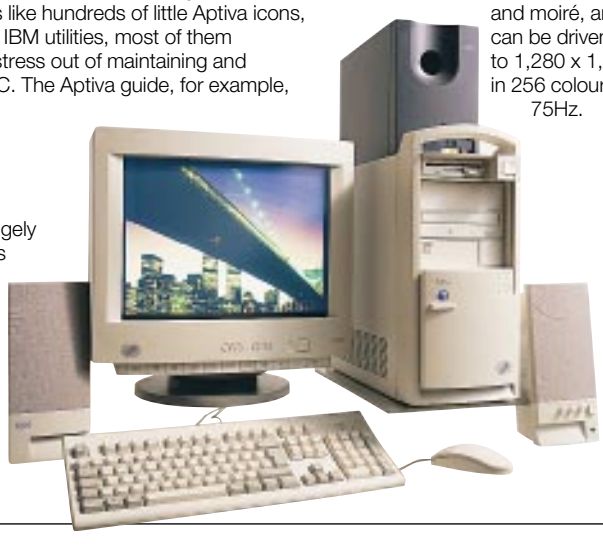
When you switch it on, the IBM branding is ridiculously in-your-face. There are what seems like hundreds of little Aptiva icons, leading you to various IBM utilities, most of them designed to take the stress out of maintaining and understanding your PC. The Aptiva guide, for example, takes you through the basics (the very, very basics) of how your machine works, while another particularly meaningless but strangely appealing utility makes your icons jiggle about on the desktop.

Inside, the design is yet again a riser card arrangement, but this time the card is parallel to the motherboard. Why this should be necessary in a mini-tower case is anybody's guess. On this card are a massive six ISA slots but only two PCI slots, again a rather backward-looking feature. To compensate, the modem does use IBM's rather excellent Mwave chip.

The time has come to do as IBM did a few years back with the ThinkPad range and rethink the whole approach. The new Stealth machine seems to show evidence of a rethink, so if you can hang on until next year, it might be worth waiting for the Stealth.

Monitor:

The G70 17in monitor does not have the largest actual viewing area of the 17in monitors we have seen, but has some compensations. The colour is good, it is almost free of flicker and moiré, and it can be driven up to 1,280 x 1,024 in 256 colours at 75Hz.



PCW Details

Price £2,339
Contact IBM 0990 727272
Hardware Bundle IBM speakers and sub-woofer.
Software Bundle See features table.
Warranty Terms 1 year on site, extended to 3 or 5 years.
Technical Support Free telephone & fax support.
Good Points ATX motherboard, monitor, software bundle.
Bad Points Feels outdated, as if it is trying to keep up but only hobbling along behind.
Conclusion Shows promise, but fails to deliver.
Software Bundle ★★★★
Build Quality ★★★
Overall Value ★★★

p199 ➢

Packard Bell 9005D

The name of Packard Bell has long been synonymous with consumer PCs. As such, the main feature of any Packard Bell machine is its Navigator interface. (This should not, of course, be confused with the Netscape product.) It is a means of operating the PC without ever having to come into contact with anything as tricky as an operating system. Navigator sits on top of Windows 95 and you can opt to go back into Windows, but on boot-up Navigator will, very slowly, launch automatically.

Navigator allows easy access to all the applications on the PC, breaking them down into areas according to how they think the PC will be used. There is a kids' section, a work section, and an area devoted to manuals and on-line help. Planet Oasis has been added, which allows limited internet access to approved, family-friendly sites. Navigator is a good idea if you want to keep meddling fingers away from the system before they start deleting necessary files or if you want a really easy PC to start learning on, but I would question the educational value of having a PC and not learning to use the operating system properly.

Inside the machine, the riser card system doesn't allow for much expansion room, especially as the only free PCI-only slot is uncomfortably tight up against the central bar holding the riser card in place.

Although this was one of the cheapest machines in the test, many of the optional extras offered in the other Packard Bell models were not included in this deal. The MediaSelect and Remote control, which both control the multimedia elements of the machine, are not included in the price, although we were sent these for test. Nor were the radio tuner and the modem, while the graphics chip we saw was not the promised 3D model but a much older Cirrus Logic chip.

Monitor:

All of Packard Bell's models come with a 14in monitor which is smaller than we would recommend. A 15in monitor may not sound much bigger, but that slight increase in viewing area makes quite a difference. Although this monitor could be driven at 1,024 x 768 in 256 colours at 75Hz, in reality it would only do 800 x 600 in 256 colours at 60Hz, a far from respectable performance due to the poor graphics chip.

PCW Details

Price £1,799

Contact Packard Bell 01753 831914

Hardware Bundle Phase II speakers.

Software Bundle See features table.

Warranty Terms 1 year on site; 2nd & 3rd year optional.

Technical Support No free phone or fax support.

Good Points Speakers, large software bundle.

Bad Points Poor graphics, limited hardware bundle, very slow.

Conclusion A cheap machine, without a modem, 3D graphics or sub-woofer. If these were included, it would be a comparable price to others here.

Software Bundle ★★★★

Build Quality ★★

Overall Value ★★★

Universal Serial Bus

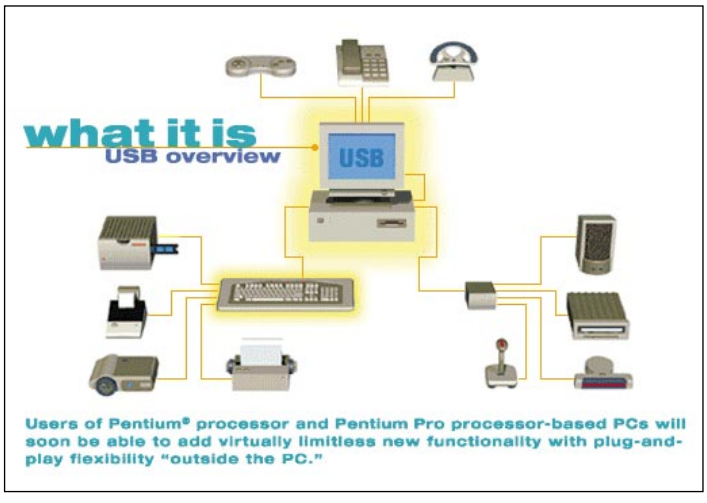
USB has one aim — to make it easier for you to connect peripherals. As it exists today, the PC can easily become choked with connections. You could have a printer on the parallel port, a mouse and a modem on the serial ports. You may add an interface card to connect your scanner and possibly a different interface card for an external tape drive. If you then plug in your speakers and your joystick to the sound card, and plug all your peripherals into a power supply, pretty soon you are left with electric spaghetti.

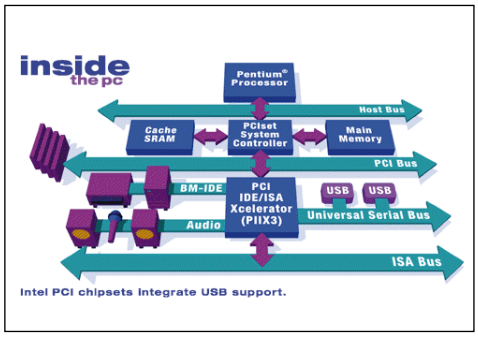
USB simplifies things by giving you just one connection via which you can connect up to 127 peripherals, including everything from keyboards, mice and modems to scanners, printers and external tape drives. The first USB peripherals are expected in this country in the first few months of 1997. We are already seeing USB ports appearing on PCs; in fact, four of the five PCs in this test have the connection ready.

USB is supported by specific chipsets on Pentium and Pentium Pro PCs; software drivers will be included in Windows 95 and Windows NT. Each peripheral is automatically managed by the PC. The PC senses which peripherals are connected, even if they are connected while the system is running so peripherals can be hot-docked. The PC will also manage the resources, from drivers to bus resources for each peripheral, while the peripheral can take its power directly from the PC itself.

Full-speed USB bandwidth of a stonking 12Mb/sec will support such things as external CD-ROM drives and telephony devices, as well as providing ISDN and PBX interfaces. Meanwhile, low-speed bandwidth of 1.5Mb/sec will support low-end devices like mice and keyboards.

The system works like a daisychain on a series of hubs. To each USB hub, up to seven peripherals can be attached. This can include a second hub up to which another seven peripherals can be attached and so on.





How USB connects inside your PC, and how the peripherals connect outside. *Pictures courtesy of Intel*

p201 ➢

Intel MMX chips

The new MMX chip will have the same array of pins as the current Pentium chips and so will fit in the same sockets

You may well be asking yourself what to buy this Christmas, but there is one rather more fundamental question which you ought to consider. Is it actually the right time to buy a PC at all?

Intel has finally announced its long-awaited MMX chips which will be available from the beginning of next year, just two weeks after a nation of excited first-time PC owners have unwrapped what they believe to be the last word in computing power.

MMX chips include an extra 57 instructions, 32Kb of L1 cache (as opposed to 16Kb on current Pentiums and Pentium Pros), larger registers and parallel processing. The 57 new instructions are primarily designed to make multimedia applications run faster. Applications will be optimised to run on MMX processors, but will recognise old-style Pentiums and will offer them code they can cope with.

However, it is the changes to the cache and the registers which will make the most difference to performance. The benefit of the increased size of the level one cache is obvious, as the processor can store more data close to hand without having to store in the more inaccessible level two cache or in RAM. The eight MMX 64-bit registers will each be able to hold eight bytes of data, and all eight bytes will be processed in parallel per clock cycle when running MMX-enhanced code. Current processors have general 32-bit registers which can only hold one byte at a time, and only one byte can be processed simultaneously.

The applications most likely to be affected are graphics-heavy packages, especially those where 3D rendering is a factor. Adobe's Photoshop 4 already supports the new hardware, while a host of multimedia CD titles are currently under development and will be shipped with MMX machines. *PCW* had a sneak preview of one, the Space Station Simulator from Maris, a virtual reality trip around NASA's planned space station, and we were duly impressed. The 3D rendering of the station is impressive, as you undertake your own space walk around the outside or investigate the various laboratories inside.

The first MMX Pentiums will be available at the beginning of January and prices will not be available until then. However, it will be no surprise to you if we say you can expect to pay a premium for the new technology. Pentium Pro will also get the MMX makeover in the near future, and there are distant plans for MMX upgrade chips.

What else to consider when buying a PC

If you decide the bargains on offer this Christmas are worth going for, it is as well to keep a sharp eye peeled for the kind of peripherals you are getting with your PC. After all, if you want to play games and the speakers crackle and the monitor flickers, there is no point at all in having a chip that can run a game at a high speed.

The monitor is probably the most important decision you can make when buying a PC and one which is frequently ignored, especially judging by the poor assortment of contenders in this test. We would not recommend you buy anything smaller than a 15in screen. It may seem on paper as if there is not much difference between 14in and 15in, but in practice that extra inch can make all the difference. If you can afford it, we would recommend a 17in screen. Again, you may say that size isn't everything, but believe a girl who knows when she says it is. The most obvious reason is that you can get more on the screen, and this makes it much easier on the eye. Whatever size your monitor, and whatever resolution to choose to run it in, you should ensure that the refresh rate will be over 70Hz non-interlaced. Anything less than this and you will notice the monitor flicker.

Obviously, your monitor is only as good as your graphics chip and you should ensure they are both able to run at the resolution and refresh rate you require. 3D graphics chips are not all they are cracked up to be (see this month's round-up for details, page 210), but the quality of graphics chips does vary. Another factor to consider is the amount of video RAM provided with the system. For the best performance we would recommend at least 2Mb of video memory. This will not only let you run at higher refresh rates, but at higher resolutions and in more colours.

When looking for speakers, get the best deal you can. Listen to them to judge what sort of hiss and crackle they give. They should be externally powered, as these are generally more powerful. They should also be well shielded or they will interfere with your monitor, making the screen wobble.

Again, your speakers can only be as good as the chip connverting the digital signal from your PC to analogue sound. All the machines here feature 16-bit sound chips, and the Apricot actually includes wavetable sound and all the connectors you would expect on a Creative Labs AWE-32. These include a digital output mode.

The IBM, meanwhile, uses IBM's own very clever Mwave chip. As a digital-to-analogue converter, or DSP (digital signal processor), it is able to deal both with sound and data convertion. As a result, the sound and modem functionality can all be done on one card. It can even deal with both simultaneously, so you can have music as you download.

p202 ➢

Editor's Choice

There is only one way to choose a PC — decide what you want to do with it, and then decide on the components that will best suit your needs. Not everyone will want the ultimate games machine, but an avid games player may not be interested in the wealth of children's educational titles that come bundled with these PCs.

As these PCs all have different processor speeds, we haven't chosen the winner purely from the benchmark tests, although these obviously play a part. Also, we have judged the machines' performance against other PCs of the same spec we have tested in the past. However, it is price, and the software and hardware bundles included in the deal that have as much as anything swayed the balance here.

There is one clear winner from this test, the Apricot MS540. It might not be the cheapest of the machines on offer, but it is fast and is jam-packed with excellent components and extras. The huge software bundle, Easy Manager II and sub-woofer demonstrate both attention to detail and real value for money, as do the 3D graphics chip and the best of the sound cards on offer.

As a runner-up, we have gone for the AST. It is very much slanted towards playing games, but as such has some very good extras such as the 3D graphics chip with 2Mb of DRAM. While 3D chips may not be important to non-games players and are not even that great at 3D rendering, they do at least offer good 2D performance. The build quality is excellent and, combined with the price, this sets it apart from some of the other machines in this test.

Test results

Benchmark scores

Manufacturer	Totals
Apricot	2.05
AST	1.66
Compaq	1.45
IBM	1.90
Packard Bell	1.38

0 0.4 0.8 1.2 1.6 2.0 2.4

FASTER

Doom II scores

Manufacturer	Totals
Apricot	65.8
AST	59.4
Compaq	56.6
IBM	62.3
Packard Bell	41.2

0 10 20 30 40 50 60 70

FASTER

Group Test: 3D Graphics Cards

Illustration: Daniel Mackie Photography by David Whyte

Into a new dimension

Graphics card manufacturers are giving the home user a taste of 3D technology. Dylan Armbrust puts 12 cards on the spot to see how it works.

One of man's great desires is to portray the three dimensions of reality onto a two-dimensional surface. Great artists like Da Vinci and Michaelangelo sought to portray life and perspective as closely as possible. Today, that desire is as strong as ever, and the technological push to accomplish this in computing has just begun to touch the home market.

The new buzzword in the PC industry is "3D", conjuring up images of virtual reality or CAD, and the concept has now reached the mass market. Everyone is talking about it, and, better yet, graphics card manufacturers are making it a possibility. At the beginning of last year, manufacturers were talking about the new 3D graphics revolution. Microsoft had bought the pioneering 3D software house, Rendermorphics, and was creating a 3D API, Direct 3D (D3D), under its DirectX umbrella to give games and graphics card manufacturers a common standard to work to. The spin-off from this is with us now.

Microsoft has released its DirectX standard, the most recent version of which is DirectX 3.0 (available since last October), and all and sundry graphics card manufacturers have released 3D-capable cards. Some, like ATI and Matrox, have come up with 2D/3D cards and designed their own silicon. Others, like STB and miro, have chosen the ubiquitous S3 for their controller chips, while VideoLogic and Orchid have eschewed the 2D/3D solution and aimed directly for the sweet spot of the market — the dedicated gamer.

On the games front, it was said, only six months ago, that there would be between 30 and 50 D3D games on the shelves by Christmas, yet at the time of going to press only two had been released. The delay of the DirectX 2.0 release by Microsoft caused a shortage of 3D games this past autumn when most of the graphics cards were launched. This meant that the majority of card manufacturers have had games "ported", or written for, their own hardware to make use of the new 3D technology, and that is why you'll see many of the cards with their own games bundle.

But the real question that remains is whether the technology works, and what the consumer can use it for. In this group test we put twelve 3D cards through the labs to see just how good this new technology is and where it's going. We take a look the hardware, the drivers, and overall performance across a range of tests to see where everybody stands.

p212 ➢

3D Graphics Cards Contents

ATI Pro Turbo PC2TV

The first of our 3D graphics cards comes from one of the big players in the market. ATI was one of the first companies to launch a 3D-capable card with its Rage chip. It has now moved on to the 3D Rage II, incorporating it into the Pro Turbo PC2TV card. This is one of those all-in-one cards. It handles standard 2D graphics and 3D graphics, and it's also able to output its display signal to a TV. This is great for the kids who want to see their game action on a much larger screen, like a 32in TV, rather than settle for the usual 14in or 15in PC monitor.

The half-length card comes with a minimum of 4Mb of SGRAM (Synchronous Graphics RAM) and can be upgraded to a maximum of 8Mb. The blanking plate has three connectors: D-sub, S-Video and an RCA composite Video-out for the TV. ATI was one of only two card manufacturers in the group (miro being the other) to have this feature.

Its 3D capability fared well on the Intel Media benchmark, posting the highest scores in both the 800 x 600 and 1,024 x 768 resolution tests. However, the results were different when run in the Microsoft D3D tests, where it came last. It did manage to run the D3D game, Monster Truck Madness (MTM), where the hardware acceleration was put to use, but the gameplay was a bit choppy. Most of this is down to the drivers which were authored under DirectX 2.0, as the newer drivers using DirectX 3.0 hadn't yet been released. This was no excuse, however, for the fact that when running MTM in a high resolution and colour depth, the desktop would return to 640 x 480, thus disrupting the desktop icon layout.

PCW Details

Price £179 (expected)
Contact ATI 01235 833666
Good Points Composite and S-Video out for TV display.
Bad Points Returned desktop to lower resolution after running game from higher-resolution setting.
Conclusion An average 3D card, but its 2D capabilities are excellent.
★★★

ATI 3D Xpression PC2 TV Plus

The second of ATI's 3D contingent, the 3D Xpresssion PC2TV Plus is its cheaper card. At an expected starting price of £119, it's the second best buy of the group.

The difference between the Pro Turbo and the 3D Xpression is the use of cheaper and less optimal SDRAM (Synchronous DRAM). This didn't seem to have an impact on the Intel score where it was a runner-up, but the ATI fell down on the Microsoft D3D test, which it failed to complete. According to the D3D test there wasn't enough memory on the card to complete it, which wasn't the case with other 2Mb cards.

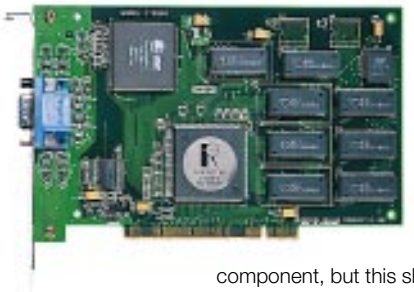
Aside from the difference in memory, the 3D Xpression comes with the same features as the Pro Turbo. It makes use of the 3D Rage II chip, and boasts composite and S-Video output for TVs as well.

Our review unit came with 2Mb of SDRAM but 4Mb cards are available. With a 170MHz RAMDAC, the card can support a vertical refresh rate of 200Hz at 600 x 480 to 60Hz at 1600 x 1200 (using a 4Mb configuration) but these figures are limited to 2D rendering only. The maximum resolution attainable for 3D rendering is 800 x 600 at 8 or 16-bit colour depths, depending upon whether there's 2Mb or 4Mb of memory respectively. The 2D engine is fine and the integrated display utilities excellent. Both the 3D Xpression and the Pro Turbo come with specially "ported" games (games specifically adapted for the card's graphics chip) which make optimal use of the chip's architecture. ATI bundles Mech Warrior II, Wipeout and Assault Rigs. The gameplay of MTM was about the same as the Pro Turbo, but not as stilted as the Matrox. Again, we ran it using ATI's version 3.0 drivers using DirectX 2.0 so this was bound to have an impact.

PCW Details

Price £119 for 2Mb (expected); 4Mb card price TBA
Contact ATI 01235 833666
Good Points Same features as Pro Turbo, but cheaper.
Bad Points Still some glitches in the drivers. D3D game acceleration disappointing.
Conclusion Average, but expected price is competitive.
★★★

Creative Labs 3D Blaster PCI



The last time we looked at a 3D Blaster it was Creative Labs' VL Bus version, and there was no definitive test we could run, let alone a VL Bus PC we could run it on. With the 3D Blaster PCI version, we can see what Creative has to offer.

The 3D Blaster comes with 4Mb of EDO DRAM and the Rendition Verite 1000 graphics chip. The card is a 2D/3D solution, like most of its competition, and its market is aimed squarely at the home. It had one of the most extensive game bundles of the lot. With Quake, Toshinden, Rebel Moon and Flight Unlimited all specially ported to the card, it stands out from the other game offerings. Its 2D capability was about average but the Blaster Control utilities impressed. A simple click on the icon allows for quick change of display settings, with the added bonus of Blaster Control rescue to help resync monitors after a refresh change.

The 3D capability was more difficult to gauge. It ran the Monster Truck Madness D3D game well with all the texture and detail settings turned on. But when we decided to change some settings while playing the game, it would default back to software rendering and revert to a slow, choppy game until we reloaded it. It would also default back to a 640 x 480 desktop if we ran in any resolution and colour depth above 800 x 600 in 16-bit colour.

Again, we were forced to use its drivers without the updated DirectX 3.0 component, but this shouldn't have had that much of an effect on MTM.

On the Intel test it came in the bottom quarter of the pack with a scores in the low 90s, while on the Microsoft D3D test it managed to place an impressive second overall, but 3D hardware acceleration only registered in 16-bit colour depth.

PCW Details

Price £169
Contact Creative Labs 01245 265265
Good Points Good handling of D3D game.
Bad Points Drivers need to be fine-tuned for 3D gameplay.
Conclusion Good all-round graphics card, but wait for the new DirectX 3.0 ready drivers.
★★★

p214 ➢

Diamond Multimedia Stealth 3D 3000XL

The Stealth 3D 3000XL is slightly different from the rest of the pack. It is being marketed, and priced, for high performance users. It has 4Mb of VRAM and, like many cards in this group test, makes use of the S3 VirgeVX chip.

There's only one ported 3D game (Descent II) in the box but Diamond *has* included Compton's Encyclopaedia and Asymetrix 3D F/X. The 4Mb VRAM card has a 220MHz integrated RAMDAC which will support up to 1600 x 1200 resolution at 75Hz. Diamond also offers a 2Mb solution for those with less demands and less money.

Its score on the Intel Media benchmark came out on the low end, but it managed to score above-average marks in the D3D tests. This was particularly noticeable in its running of the D3D game, Monster Truck Madness. The game readily made use of hardware acceleration and the game flow was reasonably smooth, even with all the texture and detail set to maximum. But, like the Creative 3D Blaster, once the game was interrupted it lost its smoothness and reverted back to poor detail and gameplay.

The 2D component showed itself to be particularly good, but this area is Diamond's forté. The drivers integrated in the Control Tools display utilities also showed their strength, especially with the multiple desktops option and pop-up menus. The drivers we received included the older DirectX 2.0 APIs, but Diamond expects to have updated versions by the time this review is published.

The card we received had only a standard D-sub monitor connector, but a TV connector, similar to the ones ATI and miro have, should be integrated into the 3D Stealth by the time we go to press.

PCW Details

Price £179 for 2Mb; £215 for 4Mb
Contact Diamond Multimedia 01189 444400
Good Points Solid all-round performer, strong in 2D.
Bad Points 3D driver component a bit flakey.
Conclusion Strong on 2D, above-average 3D and five-year warranty make it competitive.
★★★

Elsa Victory 3D

This German company has yet to fully crack the UK market and it looks like it still has a lot of work to do if it expects to with the Victory 3D. The Victory was one of the six S3 Virge-based cards in the group. It carries 2Mb or 4Mb of EDO DRAM, but our review model came with 2Mb.

The S3 Virge chip includes a 220MHz RAMDAC to provide up to 1280 x 768 resolution in 8-bit colour at 76Hz. Oddly, we found we couldn't adjust the refresh rate above a flickery 60Hz when operating at a resolution of 1024 x 768 in 16-bit colour. No matter what we did, it wouldn't change. This is bad.

The performance of the Elsa disappointed on many occasions. We couldn't get Monster Truck Madness to recognise that a 3D hardware acceleration card was present, so gameplay was abysmal. It finished middle of the pack on most of the tests, like the other S3-based cards, but it did come up short in its 2D component.

Again, the card faced problems when confronted by D3D. When running these tests, we could only get it to function if it operated with the mono rasterisation turned on instead of RGB rasterisation like the rest of the cards.

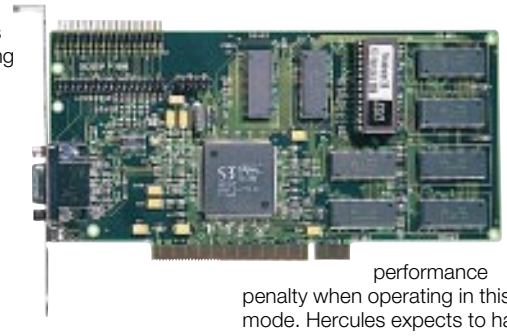
The games bundle consists of the S3-ported games Battle Race and Terminal Velocity, which we found ran well. Also included is a 3D web VRML plug-in, called VR Scout, to exploit 3D web sites.

The Victory 3D has a good set of display utilities in the form of WinMan, which offers the usual zoom, virtual desktop and other functions.

PCW Details

Price £189 for 2Mb; £249 for 4Mb
Contact Force 2 International 01844 261872
Good Points Nice-looking utilities.
Bad Points Overpriced, and drivers too flakey.
Conclusion Drivers need serious work, and for what it offers, it's overpriced.
★

Hercules Terminator 3D



Hercules is an odd company. Once true to its name, it dominated the market, but alas, this is no more. It does, however, appear to be making a comeback of sorts.

The Terminator 3D is one of the weapons it plans on using to do this. It's an S3 Virge chip-based card that comes with 2Mb or 4Mb of EDO RAM: our unit came with 4Mb. This S3 model came with an integrated 135MHz RAMDAC, so its refresh and resolution capability was more limited than that of the Diamond with a 220MHz RAMDAC.

Hercules didn't provide us with a driver capable of running any D3D games. In fact, it completely abandoned DirectX 2.0-based drivers, based on its opinion that they were buggy. Hercules has adopted the new DirectX 3.0 API instead — an honest approach, but unfortunately we were left to use generic S3 Virge drivers to get the card to run in our 3D tests. As a result, we can't accurately say how good or bad the Terminator is, but judging by our results, it seems to be exactly what you'd expect an S3-based card to be: average.

However, we did use Hercules' drivers in our 2D test and it performed very well, especially at 800 x 600 in 24-bit colour. Hercules has optimised the driver for true-colour operation, which is good news for those who don't like to pay a performance penalty when operating in this mode. Hercules expects to have new drivers incorporating the DirectX 3.0 API by the time we go to press.

On the games front, the Terminator 3D comes with Descent II.

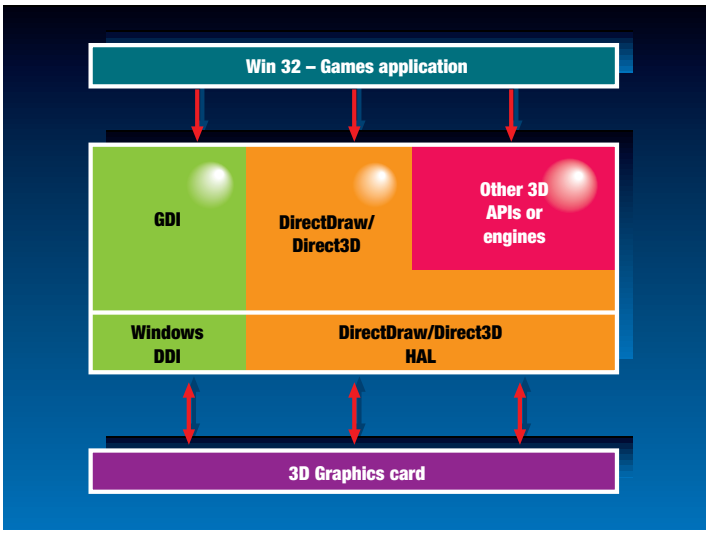
PCW Details

Price £111 for 2Mb; £142 for 4Mb
Contact Imago Micro 01635 861122
Good Points Showed excellent 2D performance; lowest-priced of the lot.
Bad Points Same D3D game faults as Creative and Diamond.
Conclusion Strong on 2D, hopefully as good on 3D. Looks like a good buy.
★★★

p219 ➢

What is 3D graphics all about?

To accomplish 3D computer graphics you need two things: lots of computer muscle and memory. Only since the advent of the higher-clocked Pentiums has 3D been feasible. But even with these in place, it still isn't enough to cope, and that's where the 3D graphics card comes in. The graphics chip, whether it's dedicated to 3D or a dual-purpose 2D/3D chip, removes the bulk of the load off the CPU and performs the rendering of the image itself. All of this rendering, or drawing, is accomplished through the graphics pipeline.



The 3D graphics pipeline consists of two major stages: geometry and rendering. The geometry stage, performed by the CPU, handles all polygon activity and converts the 3D spatial data into pixels. The rendering stage, handled by the 3D hardware accelerator, manages all the memory and pixel activity and prepares it for painting to the monitor.

In the geometry stage, all 3D images are broken down into polygons. Each polygon is analysed and assigned various characteristics. Objects are defined for their co-ordinates and combined into a single co-ordinate system called a World Space Co-ordinate. Any elements which fall outside the display window are clipped or discarded.

User input (i.e. playing) within the World Space causes the object to move. As it moves, its geometry must be revised and recalculated. This is known as Transformation and involves changes to the X, Y and Z (or depth) direction. A good example is Duke Nukem 3D: as the hero (the player) runs through a door and turns left into a room, the whole scene changes; as he moves closer to the door it must get bigger, and as he turns left a whole new room scene must be created, giving the illusion of depth. Added to this are changes in camera (view), lighting, texture and colour of the objects, all of which must be calculated or recalculated. After all these calculations have been made, the CPU hands the processing tasks to the 3D hardware accelerator. This is known as the set-up stage and it's the last stage before rendering (drawing).

In the rendering stage, performed by the hardware accelerator, the 3D engine draws the pixels. The bottleneck here is memory access — how fast the pixels read and write to the display memory (frame buffer). There are thousands of polygons for each frame of a scene, and these must be updated and transmitted through the memory at least 30 times a second, to give the illusion of movement. This transfer to the frame buffer is known as frame rate and is measured in frames per second (fps). From there, the frames are transmitted to the RAMDAC (Random Access Memory Digital-to-Analogue Converter) and converted into an analogue signal for the monitor where, after much mathematical manipulation, the action takes place.

What is DirectX and Direct3D (D3D)?

DirectX is an integrated set of programming tools developed by Microsoft to help developers create a whole range of multimedia applications for the Windows 95 platform. It covers almost all aspects of multimedia content.

The main components, or Application Programming Interfaces (APIs), consist of DirectDraw for accelerated 2D graphics, DirectInput for joysticks and other related devices, DirectSound for audio, DirectPlay for network connectivity (especially for internet games) and Direct3D (D3D) for real-time 3D graphics. D3D is the most important API for 3D game producers and 3D-capable graphics card manufacturers. The key to D3D is that it allows the game developer to author games independently of the PC's hardware (in this case, the graphics card). Unlike games consoles such as the Sega Saturn, which has a consistent hardware platform and is thus easy to write games to, PCs are notoriously inconsistent in their hardware make-up.

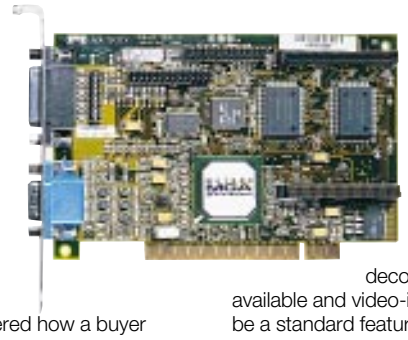
D3D has removed this variable with the introduction of a Hardware Abstraction Layer (HAL), thereby making the software device independent. The HAL provides an interface to capabilities that are widely implemented in 3D graphics hardware and allows the manufacturers to produce drivers which link the HAL to the hardware. This allows the D3D applications to exploit the hardware features without having to be authored for that particular device.

In theory, this is a brilliant idea: games producers could make D3D games and they should run on any 3D-accelerated graphics card. But regrettably, this isn't the case at present. Due to long delays in the original release of DirectX and some bugs in the subsequent releases, a situation arose where the hardware vendors had 3D-capable hardware but there wasn't any software to use it. At the time of going to press, only two D3D games had been released, whereas previously, up to 30 had been expected before Christmas. This lead to the current situation and a step back to device-dependent games ported for the specific hardware on the card — that's why you see the current crop of 3D cards with their own games bundle.

With the latest release of DirectX version 3.0, all this is supposed to change, but not until after Christmas. Expect to see fully DirectX 3.0-compatible drivers for all hardware vendors by Christmas and the anticipated wave of D3D games early next year.

p221 ➢

Matrox Mystique



When we first looked at this card a few months ago, we didn't have any 3D tests and nothing against which to compare it, so we really didn't know how good it was. But now we do, and sadly, the Mystique, Matrox's spearhead into the consumer market, comes up appallingly short. The trouble started when we tried to install the card. Windows 95 recognised it on the first go but it wouldn't load the drivers properly. After five attempts and a couple of lock-ups, we managed to install the card by loading an older set of drivers (v 3.14) first and then installing the newer (v3.16) drivers afterwards. If *we* had such problems, we wondered how a buyer without a driver library would fare.

On the performance side, too, the Mystique comes up short. Very short: it came last in the 2D test, in the bottom half of the Intel 3D test, and it would only run the Microsoft D3D test at a resolution of 800 x 600 in 16-bit colour and nothing higher. Judging by the polygon throughput the Mystique scores unexpectedly low, especially when compared with the lower-rated S3 chips. The D3D game, Monster Truck Madness, barely chugged along, even with the settings set to minimum, and it practically ground to a halt when set to full-screen and maximum detail.

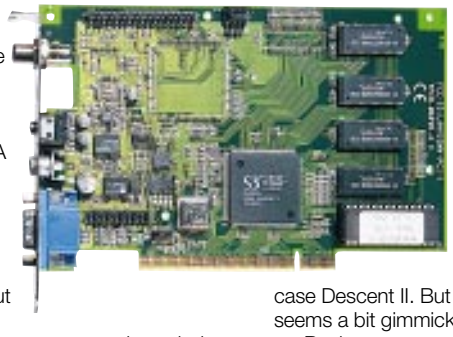
The card itself contains the Matrox MGA-1064SG chip and 2Mb of SGRAM, although you can upgrade to 4Mb. There's an MPEG decoder option available and video-in/out will soon be a standard feature on the blanking plate, just like the ATI.

The games bundle consists of ported Mystique versions of Scorched Planet, Destruction Derby 2, Mech Warrior II, plus a 3D web browser and MPEG software.

PCW Details

Price £120 for 2Mb; £160 for 4Mb (both plus VAT)
Contact Matrox UK 01793 441100
Good Points Good games bundle.
Bad Points Drivers didn't load properly. Performance is very disappointing.
Conclusion The offspring of the beloved Millennium is an errant child. Let us hope they get the drivers right next time.
★

miroMEDIA 3D



miro products are a bit like a determined but old and tired boxer in the ring with a new, young champion. They try to compete but they always fall down in the end: you knew they shouldn't have been there in the first place.

The same can be said of the miroMEDIA 3D — it was trouble from the beginning. Loading the drivers proved to be a convoluted process. Windows 95 identifies the card, but one must make use of the miro Setup manager to install the components. This is good for beginners, but it could confuse those familiar with the standard driver installation routine. Oddly, once we went through the setup routine, we found that two drivers, both for the miroMEDIA 3D, had been installed but only one of them worked. Why install two drivers if only one works?

Then we moved on to the testing. When we began to run our tests, we discovered that the 3D hardware acceleration component wasn't being recognised. miro informed us that there were no DirectX API's in these drivers, and therefore no D3D, so it wouldn't run in our tests. The company is releasing updated drivers by early December. We did try a generic S3 Virge driver, but it failed to work with the card.

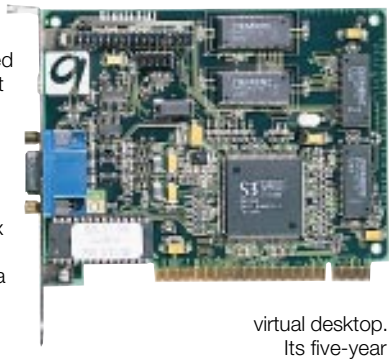
Miro has included in its package a set of Simuleyes glasses that offer visual 3D action when run with particular games, in this case Descent II. But the whole thing seems a bit gimmicky.

By the way, watch out for spelling mistakes in the manual and in the software utilities on the desktop, as it's a reliable sign of quality control. miro has given the option "Allways on top".

PCW Details

Price £140 for 2Mb
Contact miro 01494 510250
Good Points Sadly, none.
Bad Points Too expensive with nothing to offer.
Conclusion This card just isn't in the running.
★

Number Nine Reality 332FX



The Reality 332FX is yet another S3 Virge chip-based card. The 332FX is Number Nine's low-end consumer graphics card aimed at the home user and its performance doesn't quite match the reputation of ithe company's better-known high-end cards.

The 332FX is a pretty basic 2D/3D card that only comes with 2Mb of EDO RAM. It can handle resolutions and refresh rates from 640 x 480 in 32-bit colour at 115Hz to 1280 x 1024 in 8-bit colour at 75Hz, which is pretty standard for most of the S3 Virge cards with a 135MHz RAMDAC. There are no extra connectors, such as TV-out, but it does have the standard VESA connector if needed.

We ran our tests using their version 1.21 beta drivers and found the results to be fairly reasonable on the Intel Media benchmark, placing it a respectable fourth. However, it wouldn't run the Microsoft D3D test at 1024 x 768 in 16-bit colour due to lack of memory. When running in 800 x 600 in true colour we found the scores to be below par. Its 2D capability was respectable, coming in only half a point behind the Diamond Stealth 3000XL.

The 332FX comes bundled with Terminal Velocity, Havoc, and Screamer, all ported to the S3 chip. In addition, Number Nine includes the Asymetrics 3D web browser.

One of the stronger aspects of the 332FX was the Hawkeye utilities. The easy-to-use interface allows you to change refresh rates, zoom and operate using a virtual desktop.

Its five-year warranty and 24-hour technical support give the 332FX a good leg-up over some of the other S3-based cards. New drivers are due by early December.

PCW Details

Price £125 for 2Mb
Contact Number Nine 01707 827926
Good Points Good games bundle, fair price.
Bad Points Performance under par.
Conclusion A purely average card.
★★★

p222 ➢

Orchid Righteous 3D

Personal Computer World Editors Choice

The Orchid is one of two dedicated 3D graphics cards in this group test. The serious gamer who wants the best performance and doesn't want to settle for 2D/3D solution is its market. It can also be looked at as the perfect add-in card, as there is no need to throw away your old graphics card: the Righteous works in conjunction with it.

Installing the card was as easy as pie. We just seated the card into the PCI slot, attached the loop-through cable to the existing graphics card and turned on the PC. Windows 95 detected the Righteous and driver installation went without incident.

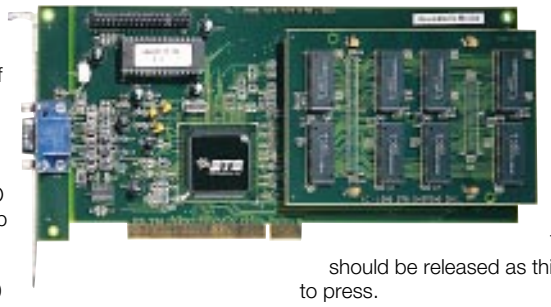
The Righteous comes with 4Mb of EDO RAM and makes use of the 3DFX Voodoo graphics chip. It displays only in 640 x 480 resolution in 16-bit colour but it offers a refresh rate selection utility. It works by bypassing your regular graphics card when it detects any 3D API-based games. This includes its own ported games as well as those using D3D, Criterion's Renderware, and Gemini's OpenGVS. Once the API is detected, it literally clicks in as the operating graphics card and displays the image.

Performance is outstanding. It ran Monster Truck Madness smoothly and glitch free, with all textures and details on maximum. On the Microsoft D3D test it out-scored all except the VideoLogic Apocalypse 3D by almost two to one. There is no score for the Intel benchmark because it will only run in a full-screen environment, not a windowed one. It has the largest game bundle, including Fatal Racing, Descent II, MechWarrior II and Actua Soccer, all ported to the 3DFX chip. There are trial versions of the D3D games Monster Truck Madness and Hell Bender, plus Criterion's Renderware version of Scorched Earth.

PCW Details

Price £199 (plus VAT)
Contact Orchid 01256 479898
Good Points Fast fast fast.
Bad Points Pricey.
Conclusion If you want fast, 3D gameplay, take a look at this.
★★★★

STB Velocity 3D



The Velocity 3D was the last of the S3 Virge-based cards we looked at. STB has been around for a while and, like Hercules, tends to hover in the middle of the pack, both in terms of profile and performance.

The Velocity 3D we received came with 4Mb RAM. It is also available with a whopping 8Mb, comprising 4Mb of EDO VRAM and 4Mb of EDO DRAM. The chip is actually the S3 VirgeVX chip with integrated 220MHz RAMDAC. It's capable of refresh rates of 160Hz at 640 x 480 up to a solid 80Hz at 1600 x 1200 resolution, even though there are few monitors available that will support 160Hz.

When trying to run the D3D game, Monster Truck Madness, we encountered similar problems to that of the other S3-based cards. The game had problems recognising the 3D hardware acceleration, it ran poorly, and returned to the desktop to 640 x 480 even if it had started in a higher resolution. It fared poorly on the Microsoft D3D test, particularly on the polygon rate throughput. On the 2D tests it bettered both the Elsa and the miro, but remained firmly in the middle of the pack. Driver weakness is the key here, and, of course, STB hadn't had its DirectX3.0-ready drivers ready to go during our review. They should be released as this goes to press.

The games pack is a bit slim and uncertain at the time of writing, with Mech Warrior II and Earth Seed 2 among the potential offerings. However, STB has excelled the rest by offering a ten-year warranty and technical support.

PCW Details

Price £135 for 4Mb; £199 for 8Mb (both plus VAT)
Contact STB Systems 0181 897 1003
Good Points Excellent warranty. Fair price, especially for 8Mb.
Bad Points Drivers and performance under par.
Conclusion A good offer at a good price, but the D3D driver aspects need work.
★★★

VideoLogic Apocalypse 3D

Personal Computer World Highly Commended

The Apocalypse 3D comes from UK-based VideoLogic and it includes the long-awaited PowerVR PCX1 chip. Like the Righteous, the Apocalypse 3D is a dedicated 3D rendering card aimed at the those who want the best gaming experience they can get.

The card, like the Righteous, sits in a PCI slot but no analogue loop-through cable is required. In fact, the card itself has no connectors on it at all: the interface with the graphics card runs digitally through the PCI bus. Aside from the PowerVR chip, the card comes with 4Mb of SDRAM. The Apocalypse needs to work with a graphics card with 2Mb of memory or more, as we discovered when testing it out on our benchmark PC. It's capable of handling 32-bit colour at 640 x 480 up to 8-bit colour at 1280 x 1024, which gives it a greater colour and resolution range than the Righteous 3D. We ran the ported version of MechWarrior II to test it out and the results were impressive. Detail and colour were rich at 1024 x 768 and the gameplay was still fluid.

Once the card was in place, installation was easy. Windows 95 detected the card and installing the drivers went normally. VideoLogic turned out to be miles ahead of the competition in that its drivers actually included the new DirectX 3.0 API. The Intel test uses the DirectX 2.0 API and this makes a like-for-like comparison difficult. Unfortunately, the same is true with Monster Truck Madness. Regardless, the Apocalypse 3D scored third on the Intel test, with only a third of a point separating it from the top.

PCW Details

Price £149 for 4Mb
Contact VideoLogic 01923 260511
Good Points Handles high resolutions and colour depths in 3D gameplay.
Bad Points Didn't run Monster Truck Madness well.
Conclusion A card meant for serious gamers, and the ported games run very well.
★★★★

p226 ➢

Games

MechWarrior 2

The year is 3057 and the Regular Army League has split into two warring factions, known as Clans. You are a clan member piloting a high-tech Battlemech. Your job is to blow up the enemy clan's BattleMechs, advance in rank and win the day. The 3D textures are impressive, particularly when running at a resolution of 1024 x 768 on the VideoLogic Apolalypse 3D, and the simultaneous sound of spoken computer reports, mechanical humming and the muffled pounding of your armoured feet made this game a popular and obvious choice for the 3D graphics card. Bundled with ATI, Matrox, Orchid, STB and VideoLogic's 3D graphics cards

Monster Truck Madness

A real hillbilly hoot. One of the first, and only, 3D games using Microsoft's new Direct 3D engine, it's meant to give you a real 3D experience across all 3D hardware platforms — provided the graphics card has DirectX enabled drivers. You can race in a Drag, Rally, Circuit, or Tournament setting. Even with a 3D accelerator card, the detail has a maximum resolution of 640 x 480 and should be run in 256 colours for optimum performance. One of the weaker 3D games of the bunch. Price £44.99 (incl VAT). Contact Microsoft 0345 002000

Quake

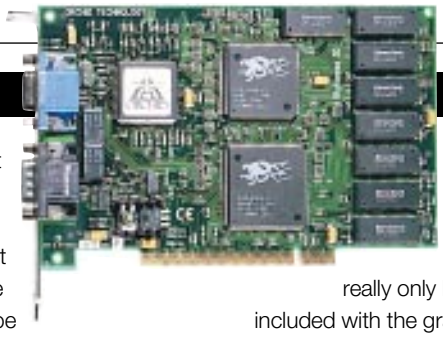
Quake is the new slash-n-blast from the people who brought you Doom. Tackle the evil alien hordes or go head to head with a network mate, with a huge array of weapons, in an attempt to restore peace to the galaxy. Quake combines excellent 3D graphics (specially-ported in this case to the Rendition Verite chip) with high-resolution graphics ability that maximises its visual impact. Creative has done well to bag this one

Scorched Planet

You are Mr Gibson, former top-flight pilot but now a washed-up and drunken supply ship captain, who is forced back into the pilot's seat to save Daytor 5 from the mean and nasty Voraxions. Using a Type 16 morphing vehicle you must drive or fly and save as many people as possible. The game looks forbidding but the detail and texture mapping is impressive, especially when run in its high-res mode of 800 x 600. This 3D game veers from the norm, making use of Criterion's own 3D API, Renderware, to give that 3D experience. It is also ported to the Matrox Mystique and compatible with the Righteous 3D and the 3D Blaster PCI. Price £39.99. Contact Criterion 01483 406200

p227 ➢

Editor's Choice



Personal Computer World Editors Choice

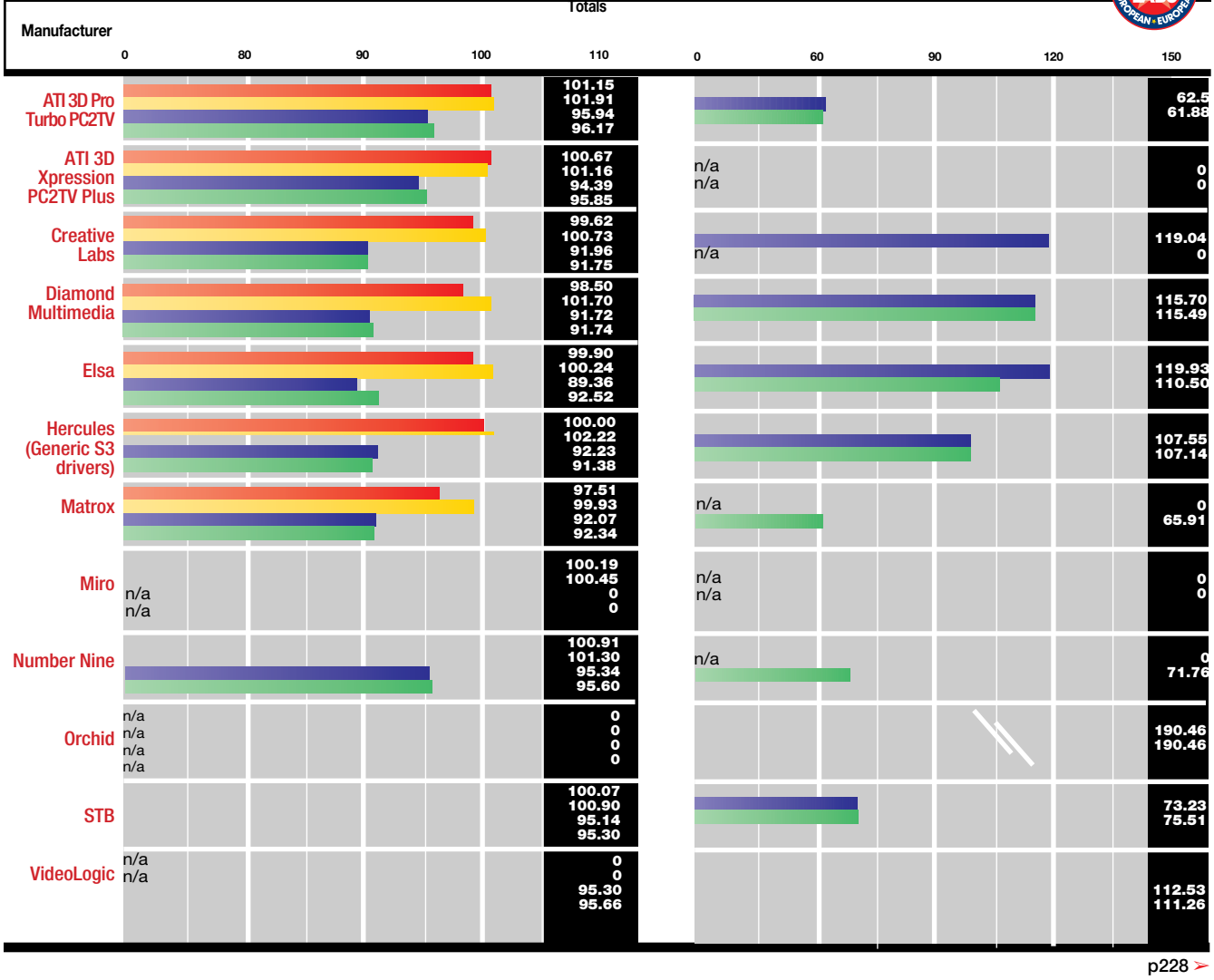
After much time and effort spent in the labs, it became clear to us that the 3D graphics card industry is still at a very immature stage. At the time we were performing our tests, we found that the whole industry seemed to be a hotch-potch and this was reflected by the participants in the group. Of the 12 manufacturers, only one, VideoLogic, had incorporated DirectX 3.0 into its drivers. Two candidates sent us cards but didn't include D3D-capable drivers: we had to use generic drivers for these. Of the rest, all had drivers that incorporated the DirectX 2.0 API even though this version is now effectively dead because Microsoft released DirectX3.0 at the beginning of October, causing everyone to scramble to make the Christmas sales season.

As a result of the delays in the release of DirectX, few games have been launched. Six months ago we were told to expect anywhere between 30 and 50 D3D-capable titles before Christmas. At the time we went to press only two, Monster Truck Madness and Hellbender, had been released and they were from Microsoft. As a result, the best 3D game experience at the moment can really only be attained via ported versions of the games included with the graphics cards. This is not a good state of affairs, especially if you want a wide 3D gaming experience. All eyes are looking towards the middle of next year before this market comes into its own.

However, we did manage to come up with an Editor's Choice — the Orchid Righteous 3D. This dedicated graphics card outperformed all, in both ported and D3D games, and was easy to install. It also included the largest games combination of the lot.

Our Highly Commended award goes to the Orchid's direct competitor, VideoLogic's Apocalypse 3D. Although not as fast as the Righteous, it nevertheless gave it a good run for its money. Its strength lies in the ability to cope with high resolutions and colour depths, and hence more vivid and textured 3D rendering than the rest of the group. Furthermore, it's a good deal at the price.

Intel Media Benchmark Tests (raw score)



Microsoft D3D Polygon Test

p228 ➢

Table of Features

Manufacturer	ATI	ATI	Creative Labs	Diamond Mulitmedia	Elsa	Hercules
Model	3D Xpression PC2TV Plus	3D Pro Turbo PC2TV	3D Blaster PCI	Stealth 3D 300XL	Victory 3D	Terminator 3D
Telephone	01235 833666	01235 833666	01245 265265	01189 444400	01844 261872	01635 861122
Fax	01235 833668	01235 833668	01245 706501	01189 444401	01844 216737	01635 868188
Price (with 2Mb or 4Mb) ex VAT	2Mb-£119 4Mb-TBA	4Mb-£179 expected	4Mb- £169	2Mb-£155, 4Mb-£185	2Mb-£189 4Mb-£249	2Mb-£111 4Mb-£142
RAM type	SDRAM	SGRAM	EDO DRAM	VRAM	EDO DRAM	EDO DRAM
Max RAM	4Mb	8Mb	4Mb	4Mb	4Mb	4Mb
Processor (graphics accel. chip)	3D RAGE II	3D RAGE II	Rendition Verite	S3 VirgeVX	S3 Virge	S3 Virge
RAMDAC (MHz)	170	200	170	220	135	135
VESA	●	●	❍	●	●	●
Other (int/ext)	TV out, VCR, S-Video SCART	TV out, VCR, S-Video SCART	❍	TV out	❍	hardware MPEG
Max bit depth @ min res	32-bit @ 640 x 480	32-bit @ 640 x 480	24-bit @ 640 x 480	32-bit @ 640 x 480	32-bit @ 640 x 480	24-bit @ 640 x 480
Min bit depth @ max res	8-bit @ 1600 x 1200	8-bit @ 1600 x 1200	16-bit @ 1280 x 1024	16-bit @ 1600 X 1200	8-bit @ 1200 x 1024	8-bit @ 1280 x 1024
Max refresh @ min res	200Hz @ 640 x 480	200Hz @ 640 x 480	120Hz @ 640 x 480	160Hz @ 640 x 480	160Hz @ 640 x 480	120Hz @ 640 x 480
Max refresh @ max res	60Hz @ 1600 x 1200	75Hz @ 1600 x 1200	75 @ 1280 x 1024	75Hz @ 1600 x 1200	76Hz @ 1280 x 1024	75Hz @ 1280 x 1024
Refresh rate select util	●	●	●	●	●	●
Virtual desktop	●	●	❍	●	●	●
Zoom	●	●	❍	●	●	●
Windows 95 drivers	●	●	●	●	●	●
Windows 3.1x drivers	●	●	●	●	●	●
Warranty (years)	6	6	1	5	3	5
Free tech support/years	●, unlimited	●, unlimited	●, unlimited	●, unlimited	●, unlimited	●, 5
Bundled games & other	Mech Warrior II	Mech Warrior II	Quake, Toshinden	Descent II	Battle Race	Descent II
	Wipeout	Wipeout	Rebel Moon	Compton's Encylopedia	Terminal Velocity	MPEG software
	Assault Rigs	Assault Rigs	Flight Unlimited			
			Software MPEG	3D authoring software		
Game ported to the card	●	●	●	●	●	●

Table of Features

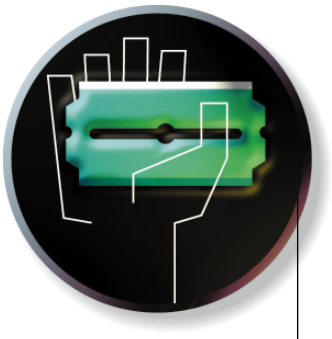
Personal Computer World Editors Choice

Personal Computer World Highly Commended

Manufacturer	Matrox	Miro	Number Nine	Orchid	STB	VideoLogic
Model	Mystique	miroMEDIA 3D	Reality 332FX	Righteous 3D	Velocity 3D	Apocolypse 3D
Telephone	01793 441100	01494 510250	01707 827926	01256 479898	0181 897 1003	01923 260511
Fax	01793 441199	01494 510070	01707 828080	01256 64222	0181 897 1006	01923 270188
Price (with 2Mb or 4Mb) excl. VAT	2Mb-£120 4Mb-£160	2Mb-£140	2Mb-£125	4Mb-£199	4Mb-£135 8Mb-£199	4Mb-£149
RAM Type	SGRAM	EDO DRAM	EDO DRAM	EDO RAM	4Mb EDO/VRAM	SDRAM
Max RAM	4Mb	2MB	2Mb	4Mb	8Mb	4MB
Processor (graphics accel. chip)	MGA-1064SG	S3 Virge	S3 Virge	3DFX Voodoo Graphics	S3 VirgeVX	NEC PowerVR PCX1
RAMDAC (MHz)	170	135	135	N/A	220	N/A
Feature connectors						
VESA	●	●	●	N/A	●	N/A
Other (int/ext)	H/ware MPEG, Vid in/out, tv tuner	TV out, S-video	N/A	N/A	No	N/A
Max bit depth @ min res	32-bit @ 640 x 480	24-bit @ 640 x 480	32-bit @ 640 x 480	16-bit @ 640 x 480	24-bit @ 640 x 480	32-bit @ 640 x 480 *
Min bit depth @ max res	8-bit@1600x1200	8-bit@1280x1024	8-bit@1280x1024	16-bit@640x480	8-bit@1600x1200	8-bit@1280x1024*
Max refresh @ min res	200Hz @ 640 x 480	100Hz @ 640 x 480	150Hz @ 640 x 480	120Hz @ 640 x 480	160Hz @ 640 x 480	
Max refresh @ max res	75Hz @ 1600 x 1200	70Hz @ 1280 x 1024	75Hz @ 1280 x 1024	120Hz @ 640 x 480	80Hz @ 1600 x 1200	(Extras/Drivers)
Refresh rate select util	●	●	●	●	●	N/A
Virtual desktop	●	●	●	N/A	●	N/A
Zoom	●	●	●	N/A	●	N/A
Windows 95 drivers	●	●	●	●	●	●
Windows 3.1x drivers	●	❍	●	●	●	❍
Warranty (years)	3	2	5	2	10	5
Free tech support/years	●, 3	●, 2	●, 5	●, unlimited	●, 10	●, unlimited
Bundled games & other	Destruction Derby	Descent II	Terminal Velocity	Mech Warrior II	Earth Seed 2,	Mech warrior II
	Mech Warrior II	Terminal Velocity	Havoc	Descent II,	Mech Warrior 2	Ultimate Race
	Scorched Planet		Screamer	Actual Socce,r		
	MPEG software		Asymetrics 3D Web	Fatal Racing,		
	3D web browser			plus more		
Game ported to the card	●	●	●	●, except trial ver.	●	●

*Depends on graphics card

●YES ❍ NO



How do they do that?

As more and more people jump on the web bandwagon, fewer and fewer know how the internet really works. Ian Wrigley has the answers.

You probably already use the internet — or if you don't, you're at least considering it. But do you know how it actually works? Sure, you can spend months or even years without knowing or even caring, as long as it does the job. But having some idea of what is happening in the background while you're working can only help, and at times, especially when you are configuring a new machine to connect, or when you are trying to troubleshoot something that's not working properly, it can be downright invaluable. So here's a little insight into what actually happens when you hit that "connect" button, or launch Microsoft Internet Explorer.

I can't get right down to the nitty-gritty, as that would require the entire magazine and more, but at least you will end up with a better understanding of what's actually happening and why some of those annoying error messages appear just when you don't have the time to deal with them.

Following protocol

The internet is a network. Big, yes, but it's still basically a network and that means each of the computers connected on that network must, at the lowest levels, speak to each other using the same "protocol".

The protocol is the way in which data is divided into small chunks, called packets, and sent over the network. When you transfer a file from one machine to another, for instance, the entire file is not sent at once. That would be foolish, since a tiny corruption occurring somewhere between your machine and the recipient would effectively ruin the whole transfer and you would have to start again. Instead, when you transfer a file, your PC, Unix workstation, Mac or whatever splits it up into small chunks and sends each chunk separately. The recipient's computer can then assemble the chunks into the right order. If one chunk is damaged, it can ask your computer to re-send it and, since each chunk is only around 1,500 bytes in size, the re-send does not take very long.

> 'The internet is a network. Big, yes, but it's still basically a network'

The protocol determines how the data is actually split up, what conventions the two computers use to talk to each other, and so on. Different networks use different protocols. For example, if you have a machine which connects to a Novell NetWare server, the protocol used is called IPX; while a Windows machine might use NetBEUI, or any of a wide range of other protocols. Unix computers talk to each other using the TCP/IP protocol (it stands for Transmission Control Protocol/Internet Protocol). Since the internet was originally made up mainly of Unix machines, TCP/IP is the protocol that the internet uses. So if you want your computer to connect to the net, it needs to be able to "speak" TCP/IP. (For more details, see the box, "Talk the right language", on page 237.)

There is a problem with TCP/IP. (Actually there are many, but let's just discuss one for now.) The protocol is designed for computers, not humans. Computers discuss things in terms of numbers rather than words, so each TCP/IP computer is given a numerical address which identifies it to the others on the network. This is known as its IP address. Think of the address as a phone number: it must be unique, as two people can't have the same number. If you know their number, you can get in touch with the person. Exactly the same happens with the IP addresses of computers.

Unfortunately, these addresses tend to be hard to remember. They are in a form aaa.bbb.ccc.ddd, so to connect to a certain computer you need to remember four, three-digit numbers. Given that most of us can hold only a dozen or so phone numbers in our memories at once, it's not surprising that an alternative to all these numbers has been created. Continuing the telephone metaphor, this method can be considered

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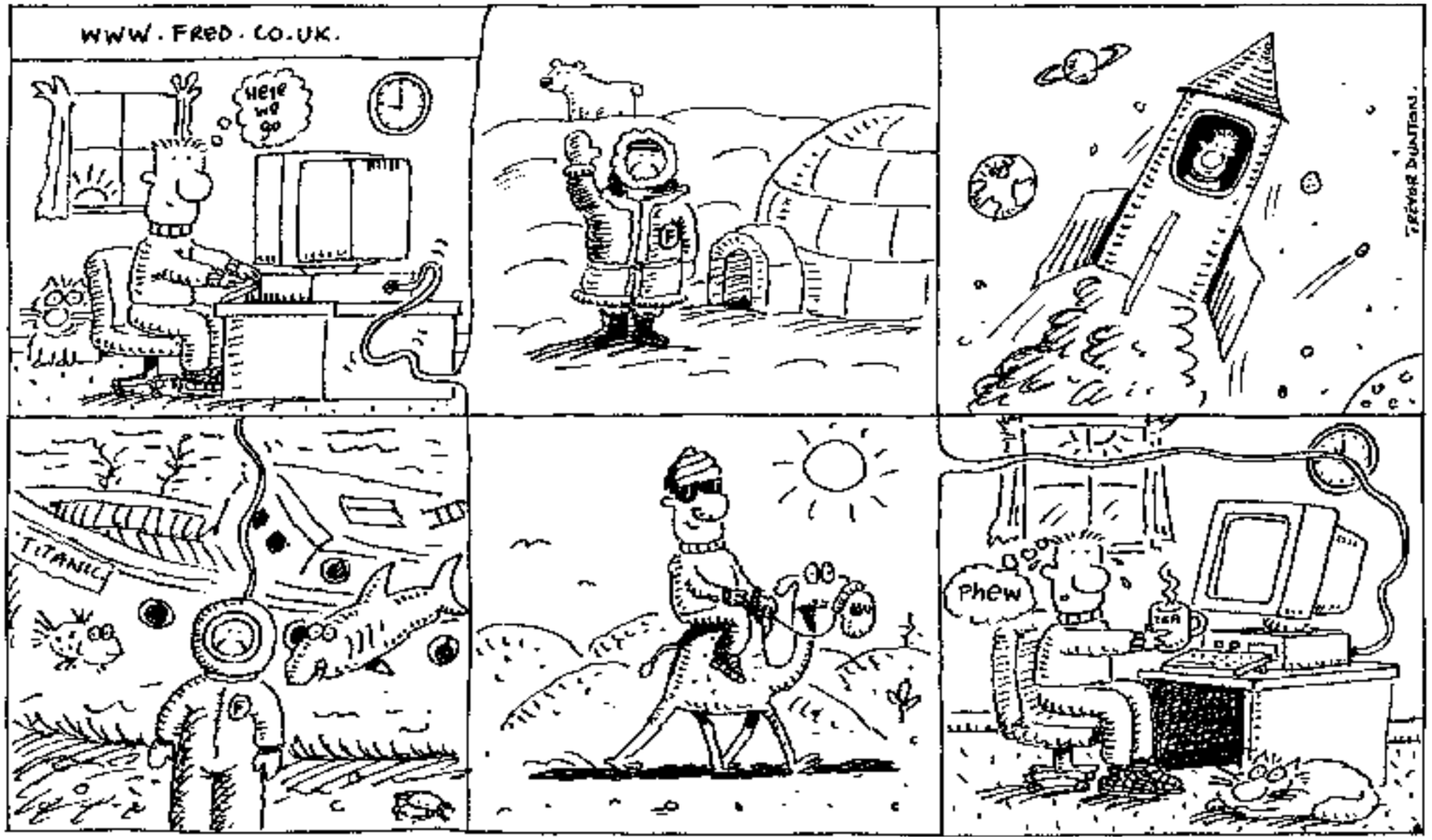

as being similar to the phone book. The method, known as the "domain name system" (DNS), is a way of mapping more easily-remembered names such as widearea.co.uk to a more complex IP number like 194.70.234.1. With DNS in place, you can now tell your computer that you want to connect to www.vnu.co.uk, or whatever. It goes away and looks up the numerical address in its "phone book".

DNS is rather more complex than a standard phone book. This is because it is not one centralised directory, but many thousands of local, smaller directories, each holding a small subset of the total information. If you are familiar with the net, you'll know that addresses are in the form computername.domain.biggerdomain.

For instance, consider fred.vnu.co.uk. This means that the computer is called "fred", and it's in the "vnu" domain, or collection of machines. This is in the "co" set of machines, which itself is a subset of the uk collection of machines. This latter collection is known as a top-level domain, since it's the last thing on the list. There are only a few top-level domains, such as "com" (US commercial companies), "edu" (US educational establishments), "au" (Australian machines), "uk" (machines in the UK) and "ie" (machines in Ireland).

The whole story

To see how the whole thing works, let's look at an example. Let's say my Unix box, which has its DNS software running, wants to talk to a machine at *PCW*'s publisher in order to transfer the file containing this article. I tell my computer that I want it to connect to fred.vnu.co.uk. But my computer has never come across any domains before as I have only just bought it and plugged it in. So as part of the configuration, I've told it about the half a dozen or so computers that know about top-level domains.

It goes out to one of these and says, in effect, "Where do I find out about machines in the uk domain?" One of these top-level servers will reply, giving the address of the computer which knows about the uk domain. So my machine goes off to that new computer and asks, "OK, you know about 'uk', where do I find out about 'co.uk'?" Having been told, it then goes off to yet another computer. Here, it is told where the machine that knows all about vnu is located and finally that machine gives my poor over-worked computer the address of fred.vnu.co.uk. Once my machine knows this, it will store the information locally, so for a while it will not have to repeat the whole rigmarole next time I want to connect. And, indeed, it will also have stored the addresses of the other machines it encountered on the way. So, the next time I want to know about a machine in the co.uk domain, it can immediately ask the relevant server.

The beauty of all this is that there does not need to be a central repository of all information. And with many hundreds of thousands of domains in existence, that is a good thing. Such a repository would be out of date and totally overworked from the moment it was set up. Instead, information for vnu.co.uk can be stored locally; probably on a machine actually controlled by VNU's system manager, and can be updated whenever any changes are made.

p237 ➢

Population explosion

The two major problems facing the internet right now are both related to its new-found popularity. It's incredible to think that five years ago, the only people using the net were academics, researchers and a few die-hard hobbyists; yet now it's become an incredibly pervasive part of culture.

If anything "defines" the nineties, it's probably the internet. More specifically, of course, it's the web — since that is the technology which really made the internet catch on in the mass market and is, in fact, what most people mean when they refer to the internet as a whole.

But this massive growth has caused problems. The first is, quite simply, that the infrastructure — the cables linking sites, at the most basic level — is struggling to deal with the extra load. It is coping, but only just. Part of the problem is that until very recently, most of the infrastructure in most countries (including the US and the UK) was controlled by academic institutions, so there were problems in terms of what was "acceptable traffic"; was it okay to allow commercial organisations to use the lines for their own, clearly non-academic, traffic?

Fortunately, the situation is rapidly changing as the large telecommunications companies around the world see the financial benefits in making sure the internet can cope with increasing traffic. BT, for instance, has just installed a new transatlantic line to the US with a massive amount of capacity. And Demon Internet, the UK's largest ISP, has itself bought 45Mb of transatlantic bandwidth. In the US, where most of the bottlenecks occur, the major telecommunications companies are vying with each other to install increasingly faster connections, so bandwidth is likely to become less of a problem as time goes by.

The other worry for those who look after the internet's more mundane aspects is the lack of spare IP addresses. When the internet was first conceived, the range of IP addresses available was considered to be more than sufficient to cope with future growth potential. However, it's now clear that we are in serious danger of running out of spare addresses in the near future. For that reason, schemes such as "IPv6" have been proposed to alleviate the problem (see Oct '96 *PCW*, p241). This will give plenty more IP addresses, but could cause headaches for system administrators and those in charge of making sure that packets actually go where they are intended to.

Only time will tell whether or not we can make the change successfully, but there is an awful lot of commercial interest in getting it right. The situation is looking positive.

The World Wide Web is the most popular destination on the internet, by far

The problem is, of course, that if just one of the servers on that long chain, through which my computer had to pass, was out of action for any reason, I wouldn't be able to find the right address. So every domain has at least one "secondary" server which contains a duplicate of the information. But even then, things can sometimes go wrong, at which point your software is likely to throw up messages like "could not resolve the domain name" or "no domain exists" when you know perfectly well that it does.

Connecting up

Now let's take a look at what happens when you use a modem to dial up to the internet, whether it's a normal modem or an ISDN terminal adaptor.

The first thing you may well have had to do is to install and configure some extra software. PCs don't use TCP/IP by default, so if you have a PC running DOS or Windows 3.1 you will have installed some extra software to tell it how to "speak" that protocol. Windows 95 PCs already have such software built-in, but even they need configuring (see "Talk the right language", below). For instance, you will need to tell the computer about a domain name server — that is, a computer which can perform that name-into-address rigmarole for you. Normally, this is an address that your Internet Service Provider (ISP) has allocated to you; it's a machine sitting on the ISP's local network. In fact, you can use any DNS server on the internet, to which you are allowed to connect, but it makes sense to use one as close to your computer as possible since this will save time. Hence, you happily type in the IP address which your provider tells you.

Wait a minute, though. Surely, if your computer is going to be on the internet, it will need its own IP address? Shouldn't your ISP have given you a unique address? Well, some do. Demon Internet, for example, gives each subscriber a unique IP address. But most use a neat, and internet-friendly, trick known as "dynamic IP allocation". (For more information on why this is a good thing, see the box "Population explosion" on pages 234/235.)

Effectively, what happens is that your ISP has a pool of IP numbers available. When you dial in, the ISP's server automatically allocates a free address and tells your computer, which then knows that this is its address for the rest of the session. When you disconnect, the IP address is freed up and can be used by someone else.

The actual dial-up connection, incidentally, is not that simple either. You can't just "talk TCP/IP" down the phone line. In fact, you use a higher-level protocol, normally PPP (Point-to-Point Protocol). This wraps up the TCP/IP packets, adds some extra information, and transmits them down the phone line. The receiving machine "unwraps" them, effectively turning them back into proper TCP/IP.

It's PPP that deals with things like the automatic allocation of IP addresses. It can even tell your computer the address of the DNS server, so you don't always need to know it in advance. There are a number of different protocols that can be used: SLIP, for instance, used to be more popular, but these days almost all ISPs use PPP as it is more flexible and has rapidly grown to be the most popular dial-up protocol around.

Once you have dialled up, your machine effectively becomes part of the internet. Your ISP is linked in via a dedicated, permanent connection, and you, on the

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Talk the right language

If you are trying to connect a Unix box to the internet, you have one thing already in your favour: Unix machines talk TCP/IP natively, without the need for extra software. Whether you are running Linux on a PC or Solaris on a high-end Sun workstation, it will be almost immediately ready to connect to the internet, either via a dial-up modem connection or, if you're lucky, via your company's leased-line permanent internet connection. If it's the latter, all you need to do is make sure you have a "legal" IP address — that is, one which has been assigned to your organisation and is unique to your computer — and you're away.

Your system manager will tell you the IP address of the router — the device at your end of the leased line which "routes" the TCP/IP packets out to the rest of the internet — which you need to add to your machine's routing table, then you can immediately connect to any other machine on the net.

If your Unix box needs to connect via a dial-up connection, you will need to get an implementation of PPP. This tends to be fiddly to configure for many Unix systems and there isn't much general advice I can give here. Check the documentation for exact details and, unless you're a Unix guru yourself, the best thing to do is find one and bribe them with beer and pizza to set things up for you. (For your reference: Unix gurus like Guinness and thin crust pizzas, but no little fishies on the pizza!)

Windows 95 also has TCP/IP and PPP built in, so all you have to do is enter the correct settings in the Network Control Panel — your ISP should give you the relevant details. Windows 3.1, however, needs extra software known as "Winsock" in order to connect. This extra software tells the computer how to use the TCP/IP protocol and how to dial up with PPP. Usually, configuration is not too difficult, and if you get the software from an Internet Service Provider, it will normally be pre-configured with the relevant settings.

other end of your modem link, are effectively now just as directly connected. You can talk to other computers and, if you're running the right software, other computers can talk to you. One of the most likely things you'll want to do is access the web using a browser such as Netscape Navigator or Microsoft Internet Explorer.

The web is a part of the internet so, deep down, you are communicating using the TCP/IP protocol. However, each of the services on the net — web, FTP, Telnet and so on — uses a different, higher-level protocol which "sits on top" of TCP/IP. Essentially, TCP/IP is in charge of getting the data from one machine to another, but then, the applications running on those machines must, in turn, agree on what form that data will take.

As far as the web is concerned, that protocol is known as HTTP (HyperText Transfer Protocol). It is actually remarkably simple, given the apparent complexity of the web. Essentially, when you access a page, your browser simply says "Hi. This is who I am, and this is the page I want." The server will then return that information using the HTTP protocol to make sure that your browser will understand it when it arrives. Just before it leaves the server, it will be divided up into TCP/IP packets to actually make the journey. At your end, those packets are reassembled by the low-level software in your PC and passed to the browser program as an HTTP message, which it can then deal with. Simple, isn't it?

Glossary

Bandwidth — Roughly speaking, a measure of how fast a connection is, and how many connections of a given speed can use the same cable. Effectively, the bigger the bandwidth of a cable, the faster your connection will be.
Class A/B/C address — IP addresses (qv) are assigned by a single organisation in the United States to ensure that they are unique throughout the world. But *you* are not assigned a single address, your organisation is assigned a range of addresses: a Class C address gives you 254 different addresses and is suitable for most companies; a Class B gives you many thousands of addresses, but there are not many Class Bs available. A Class A address gives millions of possible IP addresses to choose from, but there are very few (less than a hundred free ones remain), so you won't be assigned one unless you can make an awfully good case for it!
DNS — Domain Name System. The method of mapping a human-friendly address like www.vnu.co.uk to IP addresses that computers need to deal with.
FTP — File Transfer Protocol. A protocol (qv) commonly used on the internet to transfer files from one machine to another.
HTTP — HyperText Transfer Protocol. The protocol used by World Wide Web (qv) browsers and servers to communicate with one another.
IP address — A four-number address, written aaa.bbb.ccc.ddd, which is unique to a given computer; no two computers on the internet have the same IP address. Computers use IP addresses to locate a given device but, since they are difficult to remember, humans tend to use domain names; it's the job of the DNS to map names to addresses.
Packet — When data is transferred, it is split into small chunks, known as packets; each has enough information to tell computers where it's from, where it's going to, and the type of data it contains. When all the packets arrive at their destination, the receiving computer reassembles them to recreate the original data.
PPP — Point-to-Point Protocol. A higher-level protocol which allows computers to send TCP/IP packets (and other protocols) over dial-up lines such as modem connections. (PPP is also often used to transmit data over permanent, leased lines.)
Protocol — An agreed method that computers use to speak to each other.
SLIP — Serial Line Interface Protocol. Another way of transmitting TCP/IP over a dial-up line. These days, however, PPP tends to be the preferred method, rather than SLIP, even though SLIP can be slightly more efficient.
TCP/IP — Transmission Control Protocol/Internet Protocol. The low-level protocol used by Unix boxes, and every computer on the internet, to communicate with each other.
Telnet — A method of logging in to a remote computer over a network.

PCW Contacts

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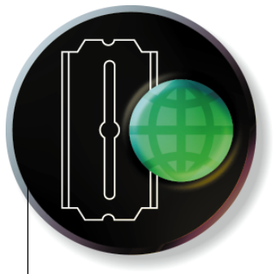


A good **turnout**

Jim Smith explains how to control the presentation of your site on a net search engine and tackle the ticklish problem of serving your attractive multimedia pages to the myriad browsers in use on the net — robots and JavaScript are the secret.

Controlling robots

Getting your site into the many internet search engines and indexes is as crucial to its success as decent content and dazzling design. It's a lot easier than it used to be, thanks to the creation of one-stop submission sites such as Submit It (**www.submitit.com**.) which let you enter your details, free, into every major index. There are a few shysters doing the rounds who are junk-emailing web developers, offering to submit sites for a fee, but this is completely unnecessary unless you're exceptionally lazy.

It is less well-known that you can control the way your site then appears within automatically-generated web indexes such as Alta Vista (**www.altavista.digital.com**) and Lycos (**www.lycos.com**).

You decide

There's a broadly-agreed META tag which lets you add to the <HEAD> portion of your page, letting you decide the words that the site will be indexed under as well as the description that appears under the URL in sites such as Alta Vista.

You've come across META before in the command used to make a document automatically refresh or point to another document. For example:

```
<META HTTP-EQUIV="REFRESH"
CONTENT="1;URL=http://otherpage.
html">.
```

META provides a way of putting extra information about a page (or instructions) into a browser without having to rewrite HTML when you want to create a new function.

In the case of search engines, META enables us to provide a way of saying "Hey Robot! Look here!" so that we can give it all the information it needs without it having to download the whole site and index that.

The HTML looks like the example in Fig 1. As I've tried to indicate, somewhat crudely, the description should be a normal piece of text that acts as a one-line introduction to your site.

Keywords should be used to provide quick indexing. You can include anything you want here. Words related to the content of the page are ideal but you can also add related topics and terms (even the names of competitors) so that your site appears as well when someone searches for those.

The description and keywords can be up to 1,024 characters, or 200 words, which is plenty of space in which to provide adequate information about your site.

Fig 1

```
<META  name="description"
content="Your description should appear here.">
<META  name="keywords" content="words, that, describe, your, site">
```

Keep out!

The equal and opposite problem is how to keep unwelcome web-crawling robots off your site. There may be sections of your site which, while not secret or private, do not benefit from being in the public domain: whether it's the canteen menu or human resources policy documents.

There's also the danger that a badly configured robot could run riot in a part of a site that provides access to a potential

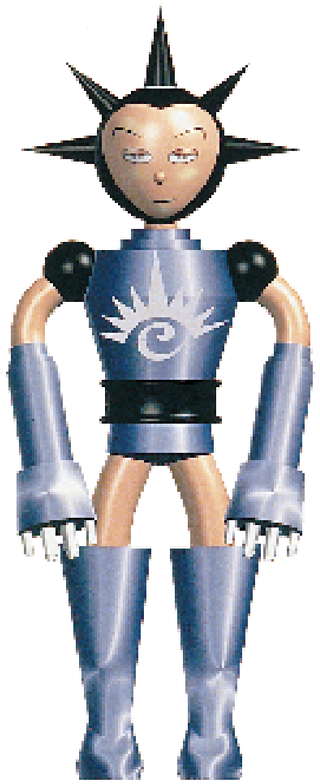


Fig 2

```
# robots.txt for http://www.site.com/

User-agent: *
Disallow: /cyberworld/map/ # This is an infinite virtual URL space
Disallow: /tmp/ # these will soon disappear
```

infinite space: for example, a clickable map or a database entry form.

While most robots now recognise and avoid these, there's still the danger that your site could simply be overwhelmed by a crude web-crawler.

To keep a legitimate robot out, you need to place a document called robots.txt in the top level of your web server's path, right next to the index.html. There are now over 111 robots that will look for this file and behave accordingly. The syntax for excluding robots is like that shown in Fig 2.

The portions following the asterisk are comments. The file can consist of as many records like this as you wish, so long as there is at least one blank line between them.

The "User-agent:" field of the document should give the name of a particular robot (Alta Vista's is called Scooter, for instance) if that certain robot has a habit of doing something unwanted, that the others don't. Or, it can contain a * to exclude all robots, as in the example.

The "Disallow:" fields give the robot a path that it's not allowed to look down: note that you don't need an asterisk to indicate sub-directories and files here; the first part of the path will do. Note how the paths start at root: don't use relative paths even though the robots.txt document starts in root.

If you only want to let certain robots in, you can add an entry in that robot's name with a blank disallow field after an entry disallowing all robots, as in Fig 3.

The robots.txt approach isn't perfect. It doesn't allow people who sublet web space to determine how their part of the server will

Fig 3

```
User-agent: *
Disallow: /

User-agent: Scooter
Disallow:
```

be indexed: they have to ask the person with overall control. However, you could write a script which automates the creation of robots.txt, although there's no evidence to show that anyone has. But as a way of stopping those pesky software agents from upsetting your server, it's the only choice we have, and autonomous software is likely to become vastly more common on the internet in years to come.

Multimedia

One of the problems associated with serving attractive multimedia pages to the web-browsing masses is that there is no single, standard browser for web developers to write to.

Not only are there myriad browsers but each can be configured differently with different plug-ins, ActiveX controls, and default settings (admittedly, Navigator and Internet Explorer dominate but even they come in different flavours). In short, browsers are bastards.

Until JavaScript, the only way you could modify the page content to match the browser that the client was using, was to write a server-side script that read the SERVER_SOFTWARE environmental variable which the browser passes to the server when it makes its HTTP request.

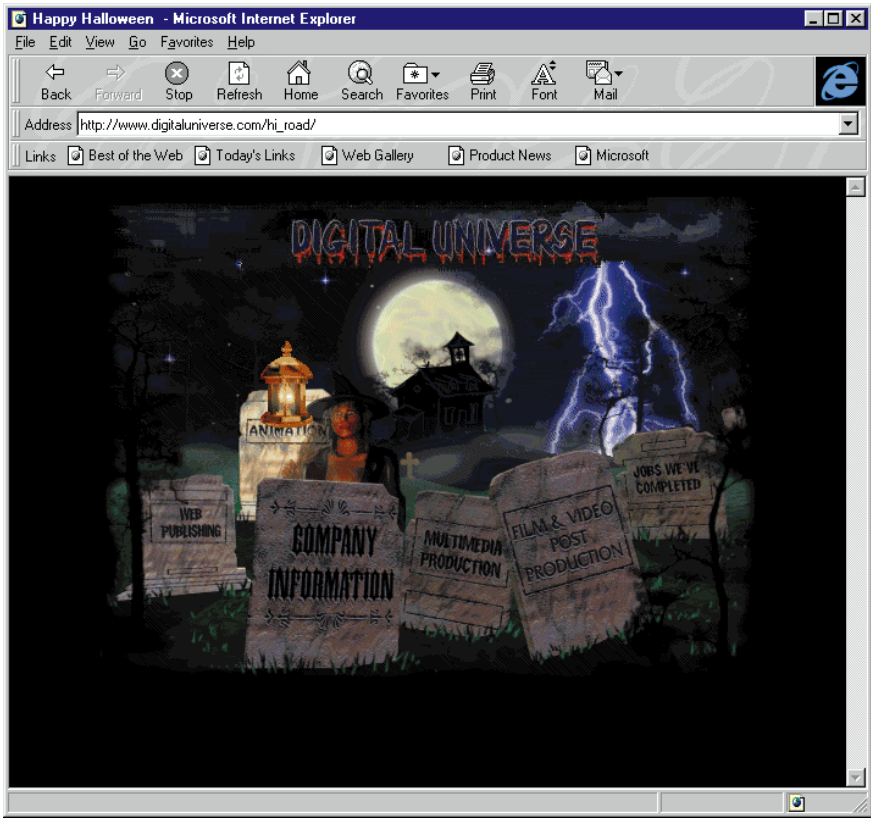
You've probably seen the outcome of a similar script at sites like BrowserWatch (**www.browserwatch.com**) which announce your IP address and domain name, browser type and operating system. This has two drawbacks: firstly, it can't handle plug-ins, and secondly, it puts an extra strain on the server which now has to perform some (admittedly trivial) calculation every time someone connects to the site.

Dynamic code

How much better then, to put the dynamic code in the page itself as JavaScript so that the server can get on with serving and leave the client to work out what it wants.

The fact that some browsers will simply ignore <EMBED> tags provides us with

p242 ➢



A spooky ShockWave plug-in — great fun for surfers, more problematic for web developers

some sort of workaround, just as <NOFRAMES> helps us out of the frames problem. But it's better to remain completely in control of your page by encasing the calls to plug-ins in JavaScript so that the JavaScript applet can conditionally decide whether or not to make the plug-ins appear. This also has the advantage of protecting browsers which object to abnormal HTML tags: as JavaScript is commented out, they merely ignore it. It also allows us to detect browsers which could take a particular plug-in, but don't.

This is remarkably simple for Netscape Navigator 3.0. The version of JavaScript which this browser supports, allows you to query the browser which will then return a listing of the plug-ins it has installed.

The quick and easy way to find out therefore goes like this: find out the name and type of the browser; if it's Navigator 3.0 or above, then ask it whether it has the desired plug-in installed. The code looks like that shown in Fig 4.

Detecting Netscape Navigator 3.0 is simple: we just break the `navigator.appName` and `navigator.appVersion.substring` strings down into their components and search through until we find the string Netscape3. If Navigator 4.0 comes out before this article hits the shelves, you'll need to add an "or" (||) to this part of the script.

If we find this to be true, we move on to the next part of the script. This sets up a function that will rattle through the listing of plug-ins that the browser will return to us, turning them into all lower case and then parsing the data for the search string. (This part of the script is borrowed from VReam which first posted it on the internet as a way of detecting for its WIRL VRML plug-in. Thanks and acknowledgements are therefore due.)

We get the search string from the next part of the script where we pass it to the function as an argument by creating the variable shocked thus:

```
var shocked = testForPlugin
("application/x-director");
```

Fig 4

```
<script language="LiveScript">

var browser=navigator.appName+navigator.appVersion.substring(0,1);

if (browser=="Netscape3"){

        function testForPlugin (Plugin) {
                Plugin = Plugin.toLowerCase();
                var Found = false, i, j;
                for (i = 0; i < navigator.plugins.length; i++) {
                        for (j = 0; j <
Math.round(navigator.plugins[i].length); j++) {
                                if (navigator.plugins[i][j].type == Plugin) {
                                        Found = true;
                                        break;
                                }
                        }
                }
                return (Found);
        }
        var shocked = testForPlugin ("application/x-director");

        if (shocked == true)
          document.write ('<EMBED SRC="test.dcr" width=500 height=150>');
        else document.write ('<IMG SRC="image.gif" width=500 height=150>');

}

// end JavaScript -->
```

p245 ➢

Fig 5

```
function probePlugIn(mimType) {
        var havePlugIn = false
        var tiny = window.open (“  “. “teensy”, “width=1, height=1”)
        if (tiny !=null) {
                if (tiny.document.open(mimeType)  != null
                havePlugIn = true
        tiny.close()
        }

        return havePlugIn

}
```

Note that we're looking for Macromedia's Director plug-in here. Each plug-in is registered within Netscape Navigator as an application type and a MIME type. To find out the types of different plug-ins, type

```
about:plug-ins
```

into the location field in Navigator (Mac users need only select “About Plug-ins” from the Apple menu).

If we find a plug-in, we ask the program to write a line of HTML code that calls a Director movie. If not, the applet writes HTML that calls a standard GIF image.

Not all browsers are equal

That's pretty straightforward but, as you might guess, there's a mighty big “else” hanging from that

```
“if (browser==“Netscape3”)”
```

because not all browsers are Navigator 3.0 or better. In fact, not even all copies of Navigator are 3.0 or better, with many people still using version 2.0 which is less demanding of your PC's resources. There's even the odd sighting of ancient beta versions (before 0.9ß) in HTTP logs.

So, people will browse with anything and, in order to cater for them, we have to be a bit more devious and replace the main window, with which we've been working, with a frameset. This immediately filters out any old versions of Navigator and Internet Explorer. If they can't read frames, they won't be JavaScript-compatible and probably won't be able to take plug-ins either.

Thus, the main body of our program goes into the main frame of the frameset. In fact, this frameset needs only one frame if necessary although you might want to take advantage of the frame layout in any case.

Now we add to our program the function shown in Fig 5 (this extremely useful piece of code comes from the Que book *Using JavaScript*, which is a godsend for the JavaScript developer).

Fig 6

```
var haveShockWavePlugIn = probePlugIn (“application/x-director”)
```

To call this function from the main body of the script, all we have to do is create a variable which passes the MIME type (which we first met earlier on in this article). See Fig 6.

If “haveShockWavePlugIn” is true, we can ask the script to write an <EMBED> tag, with a movie in it, to the main page. If not, then write the normal IMG tag into the main copy. The drawback of this approach is that it will produce a “Plug-in not found” error, but at least it automates the process.

Thankfully, all future versions of JavaScript will allow you to detect plug-ins invisibly, and even call specific plug-in features from the scripting language, so the days of large hacks like this are numbered.

PCW Contacts

Jim Smith is development manager of Wide Area Communications. You can contact him at **www.widearea.co.uk**

net.news

Around the web world with PJ Fisher.

IBM breaks its price point promise

■ Despite promises that network computers (NCs) would be cheap, low-spec devices, IBM is about to launch a 200MHz Power PC with S3 graphics chip which would appear to undermine such promises.

The NC will come with a choice of OS, including one written in Java, and Microware's OS-9 which will feature a Java Just-In-Time compiler.

The real key is the price. Expected to cost around $1,000 in the US, it will be up against 133MHz PCs. Meanwhile, the truly affordable NC remains on the drawing board.

www.ibm.com

'Active HTML' on the way

■ The HTML standards committee, the W3C, has taken another battering, this time from Microsoft. At its web developer's conference, Microsoft demonstrated extensions to HTML, codenamed Trident, that enable dynamic events activated by mouse movements.

Microsoft's description is "active HTML". A typical use is for "mouse-over events". For example, mousing over a web hot-spot would cause a sound file or movie to be activated on the web page and Microsoft sees this as a way of furthering the web experience, to more closely resemble that of CD-ROMs.

Trident could also be used to dynamically change the layout of web pages at the click of a mouse. It is expected to appear in future versions of Internet Explorer, most likely version 5.0.

Netscape has unveiled a similar technology called JavaScript Style Sheets. Both technologies are said to use scripting languages which make it far easier to create dynamic web pages than Java or ActiveX, which many web developers find tricky. However, Microsoft insisted it was not undermining the W3C.

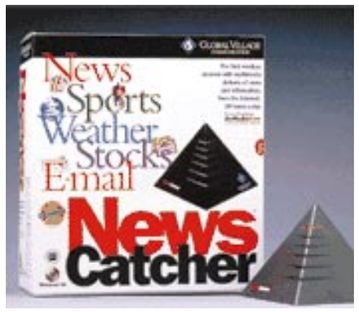
John Ludwig, VP internet platform and tools division, said: "We are not inventing new scripting languages. We are continuing to extend our HTML capabilities and intend to have the best, richest HTML support of any vendor, as we do today.

"We are dead serious about conforming to the W3C. Everything we want to do we take to the W3C, for discussion and approval. We implement all the W3C standards. Multivendor support for new HTML is critical, and the only way to achieve this is by working through the open standards process."

Both technologies have yet to be approved by W3C but both are under consideration. Given recent history, both companies are likely to push ahead without waiting for W3C approval.

www.microsoft.com
www.netscape.com

No net needed for this newshound



■ Global Village has come up with a device that will enable PC owners to keep track of news, sports and stock prices without need of the internet or a modem.

The NewsCatcher is a small, black, pyramid-shaped device that receives radio transmissions from the US paging network, Air Media, and feeds them directly to the desktop.

For $6 per month, users can choose from headline news, sports, entertainment or business, all taken from internet newswires and sources such as CompuServe. The NewsCatcher unit and software costs $149 and runs on Windows 95. There are currently no plans for a similar service in the UK.

www.globalvillage.com
www.airmedia.com

Porno spam prompts Safety-Net

Promote Responsible Net Commerce: Fight Spam!

■ Following the heated climate in the UK over child pornography, internet users across the world were victims of a "spammed" email that offered child pornography, appearing to come from an AOL member in Jackson Heights, New York. Spammed email is sent to thousands of people without their permission, often offering goods and services.

The long message described pictures, movies and sound files available in graphic detail and how to obtain them. What is worrying users and law enforcement agencies is how the person, or persons, involved could have accessed so many email addresses.

The subject of porn on the net has been heightened by recent events in Belgium and UK press reports accusing Demon Internet of promoting child pornography on the net. (Demon is now suing for libel.)

In a bid to ward off criticism, the UK ISP industry has financed the Safety-Net organisation which will have a hotline for users to report suspected illegal material being distributed on the internet. EU ministers have also met to formulate methods of combating the distribution of pornography on the internet.

Judith Coley, Director of Corporate Communications at AOL UK, said: "We are helping the law enforcement bodies as much as we can, but it is in their hands. At this stage, there are so many variants that any speculation is fruitless."

Since the spamming incident, other theories have been suggested, one being that it was a crude attempt by right-wing elements in the US to undermine the open nature of the internet with scare tactics. The other, most likely explanation, is that it was a stunt. Even so, it is one that has backfired, as the incident is being fully investigated by the FBI and the New York Police Department with a view to prosecution.

A web site has been set up dedicated to stamping out spamming on the internet.

www.vix.com/spam/

Waterstone's aims at bookworms on the web

■ Waterstone's booksellers has gone online with its first web site. The site features written excerpts from newly-released books, and information about their authors.

Visitors to the site can browse book selections and order online. An out-of-print search facility and an online version of the Waterstone's magazine completes the picture. The company hopes its site will become fully interactive with literary debate via email and live chat between authors and readers.

www.waterstones.co.uk

Browser-based business info

■ Financial Times Information has signed a deal with Verity, the search agent developer responsible for the US's acclaimed SuperPages online directory, to create a browser-based business information service. The FT Profile service, traditionally aimed at corporates, is now targeting individual business users.

The service will include personalised news, using Verity's intelligent agents to compile personal "Daily Me"-style profiles. It will also provide "alerting" bulletins on developing news. Nigel Folkes, Development Director of FT Profile, said: "What sets us aside from the web-based services is that we combine a web-based interface with a high standard of business news that you can't get on the internet."

FT Information gathers from a range of sources, including national broadsheets, the Economist, Reuters Textline, market research databases, and business and trade journals. The new web-based version of the product will be able to deliver ASCII, HTML, PDF files, audio and video.

Subscriptions are available from £99 per month per user, with a £15 surcharge for the personalised AFX newswire.

Jessica Hodgson

Financial Times Information 0171 825 8000

Post-It on your email

■ Wall Data and 3M have together launched an email package that utilises electronic Post-It Notes to send and receive messages. The idea is to make email less "techie" and more familiar to office users.

After installation, an icon appears on the desktop that dispenses blank Post-It software notes. These can then be affixed to electronic documents or sent to different email systems.

The Rumba Mail package features a pull-down command centre called a "CommCorder" — a graphical access point to all email functions including file attachment and printing.

Rumba supports many email systems, including ccMail and Lotus Notes. A universal In-Box can be set up to receive email from a number of different systems. Prices start at £26 per user.

Wall Data 0181 476 5000
www.walldata.com

p249 ➢

What a corker !

■ From the United States comes what is claimed to be the world's finest wine site. Based on the existing esoteric print magazine, *Wine Spectator*, the stylish site offers ratings and prices on over 50,000 wines. It is claimed to be the most comprehensive database of wine reviews.

However, if your idea of a fine wine is the £2.99 Hungarian red offer at the supermarket, this site probably isn't for you. The registration process asks the value of your wine collection — starting at a minimum $1,000!

www.winespectator.com

New look for Internet Studio

■ Microsoft is about to release, next year, an alpha version of its much-altered Internet Studio software (formerly known as Blackbird) and with it the revised web tools strategy. Internet Studio will be a visual programming tool to enable web developers to build active, database-driven web sites. This positions it as the newest member of Microsoft's visual tools family of products.

By contrast, FrontPage 97 will remain a mid-range web tool for non-programmers designed to integrate with the rest of the Office 97 family. FrontPage and Internet Studio components will work together, so both tools can be used to build web sites.

Internet Studio is a "component consumer", whereby it uses software components written in Visual C++, Visual J++ or Visual Basic. For example, a programmer could write a financial analysis component in Visual Basic and then integrate it into a corporate financial analysis web site, along with HTML content designed in FrontPage. Both client-side and server-side active components can be designed in Internet Studio, as well as the new Active Server Pages that Microsoft claims will bring dynamic server-side web content to any browser regardless of platform.

The final version of Internet Studio will be released in the first quarter of 1997.

www.microsoft.com

Superfast business net service

■ A UK company claims to have built its own superfast business internet service, delivering documents, graphics and videos, ten times faster than a 28.8Kbps modem. ODI's Internet 2 is based on ISDN and uses proprietary transmission protocols, but the company claims that users can connect to the rest of the internet whenever necessary, as the browser software reads HTTP data as well as that based around ODI's own protocols. The service will cost £27.50 per month.

The company is promising TV-quality video over the network, for next month, which will deliver video at 25fps.

ODI 0113 233 0000

www.ondemand.co.uk

Pipex ups the ante

■ UUNet Pipex is expected to double its transatlantic bandwidth capacity to over 90bps by the New Year, upping the stakes in its ISP battle with Demon Internet. At the same time, the company is investing in network improvements across Europe.

Put it on the slate

■ Proving that it really is difficult to make people pay for online publications, Microsoft has had to delay subscriptions to its political magazine, *Slate*, because of "difficulties with the billing system". Whether these are technical or merely a fact of web life, the company refuses to say.

Just **browsing**

Installing new browsers, sending email to Mac users, the need for speedy modems, and creating newsgroups are among the problems tackled this month by Nigel Whitfield, our knowledgeable nethead.

Q "*I use America Online and I want to use a different web browser, as the built-in one doesn't support most modern features. How do I do this?*"

A. The answer depends on whether or not you also want to be able to access other internet providers, because access to the internet via AOL is slightly different. But in any case you'll need to start by downloading the AOL Winsock file, which you can find by going to the keyword WINSOCK. You'll also find useful information at keyword NETSCAPE.

If you intend to use another internet provider as well as AOL, you should save the AOL Winsock file in a directory of its own, such as c:\aol25i\winsock. Otherwise, just make a copy of any winsock.dll file that you have in c:\windows and replace it with the file you downloaded from AOL.

The new version of AOL has a built-in web browser based on Explorer 3, so you may not need to use a different program for your surfing

For people who only use AOL, that's all you need to do. Install any internet applications, including web browsers, and they'll work fine once you've connected using the standard software. If you're using another provider, with Windows 95 Dial Up Networking for instance, it's a little trickier, but you can arrange for some programs to use AOL for internet access and others to work with your other provider.

To do this, you need to install applications you want to use with AOL, into the same directory as the Winsock file: c:\aol25i\winsock, for example. Make this their start directory, too, and then you'll be able to run them using AOL as your internet connection. Applications installed elsewhere on your system will use the main Windows Winsock file with your other provider. To make them use AOL, you'll have to swap the Winsock files each time you want to switch providers.

It's also worth upgrading to version 3 of the AOL software (which should be available by the time you read this) because it includes the AOL Winsock in addition to a built-in version of Microsoft Internet Explorer. You may not even need to worry about using a different web browser when you want to explore the net.

Opening the gateway

Q. "*I have just got myself an account with Demon, and want to set up my Linux machine as a gateway between Demon and my home network. I'd like it to act as a mail server, collecting mail at regular intervals, and as a proxy server that will dial on demand, giving me access to the web from all the machines on my home network. Where do I start?*"

A. You should be aware that doing this sort of thing is against the terms of a standard Demon dial-up account. You can do it with a network dial-up account, however, so I will assume that this is what you want. The first thing you'll need is a version of PPP that supports dial-on-demand. There are a few of these around and they work by spotting any traffic destined for the internet, automatically dialling your provider to establish the link and then dropping it after a short period of inactivity. Make sure that you have this working first, before you try to configure anything else.

If you can't find a PPP system which handles demand dialling you can, instead, use a script to bring up your link. Since you want to check mail at regular intervals, you should use the cron scheduler to bring the link up, either by calling your dialling script or by performing a task that requires use of the link to the outside world, like setting the time from a network time server with a command like

```
/etc/ntpdate ntp1.demon.co.uk
ntp2.demon.co.uk
```

which will query Demon's time servers and automatically correct the clock on your system. To have this happen automatically at five minutes past the hour, you'll need a line like this in the root user's crontab file:

```
5 * * * *      /etc/ntpdatentp1.
demon.co.uk ntp2.demon.co.uk
```

Since Demon automatically delivers waiting mail when you connect, that's all you'll need to do. If you're using a different provider you might want to arrange to run a script instead — to collect email from a POP3 mailbox, for instance.

A web proxy server is fairly straightforward as long as you have dial-on-demand networking. If you check the web pages of the W3 consortium you'll be able to find links to a number of products. The proxy server I use is the Cern HTTPD Daemon which, although a little long in the tooth, still does the job, and if you can find a binary or compile it on your own system, it will be fairly easy to set up since the sample configuration files contain almost everything you need.

If you can't make dial-on-demand work, you can still achieve something: all you need do is to configure the computers that are using the proxy so the start page on their web browsers is a page on your server.

The page can either have buttons to start and stop the PPP link to your provider, or it could just be a script that brings up the link. It's not quite as elegant as real dial-on-demand and it will misbehave if people choose a different start page in their browser, but most of the time, users simply will not be able to tell the difference.

Mail-a-Mac

Q. "*How can I send a file to a Macintosh user? I've tried sending a MIME attachment from my email program but the person I'm writing to says they can't understand it.*"

A. If you're using Eudora on the PC, then instead of MIME, you should choose BinHex from the pop-up menu in the compose window. BinHex is understood by most Macintosh email programs, and it's probably the best format to use if you're sending to a Mac user.

Not all encoding and decoding utilities support BinHex, but XferPro is one that does. You should be able to find it on your favourite FTP site. When you've converted a file to BinHex, just paste it into an email message and send it to your friend. You have to make sure you include the line

```
"(This file must be decoded with
BinHex 4.0)"
```

as it's used by many Mac programs to spot a BinHex file and decode it, automatically. All that's needed at the other end, assuming your friend doesn't have an email program that automatically decodes BinHex, is a copy of BinHex 4 or StuffIt Expander. In the latter case, just drop a BinHex file onto the icon to convert it, and in the former, choose "Upload —> Application" from the File menu.

Faster modem

Q. "*I'm thinking of upgrading from my current 14,400 modem to a new one. Should I buy one of the new 33,600 models, or wait until the promised faster ones arrive?*"

A. It's certainly worth upgrading your current modem and you can expect to see quite an improvement in the speed of access to ftp sites and the web, but don't worry too much about speeds above 28,800 bits per second (bps).

You should make sure you have a fast serial port (see previous Net.answers columns for details of how to check), otherwise the upgrade won't be worth it. In fact, if you anticipate buying one of the "coming really soon" ultra-fast modems, you should look for an intelligent serial card because even a 16550 serial chip may not be fast enough in the future.

It's important to remember that although

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the faster speeds that are currently being talked about may sound attractive, they're not all here yet. The fastest speed that's guaranteed to be compatible with other brands of modems is 28,800bps, which is the V.34 standard. Faster modems, sometimes called V.34plus, operate at 33,600bps and while many will talk to each other because they use the same chips, they're not a real standard and they're not supported by all internet providers. But don't let that put you off too much: if a modem supports that speed, it will also work at 28,800 with your current provider.

The faster speed, 56,000bps, isn't worth waiting for so if you want a new modem buy it now, but make sure that it's upgradable with "flash memory". In some cases, that may be enough to make it work at the faster speed, but in other cases it won't. Since the new modems haven't yet been launched, it's not possible to give a definitive answer.

With 33,600 there are no standards for operation at that speed, and there are several vendors making modems that won't talk to each other. If you buy too soon, you may find you're stuck with something that can't be used to its full effect without changing providers.

The best advice is to upgrade but only to a V.34 modem, or one that supports 33,600bps if your provider does. Don't worry about the faster models on the horizon: they'll be expensive and you can expect compatibility problems until the market has settled down.

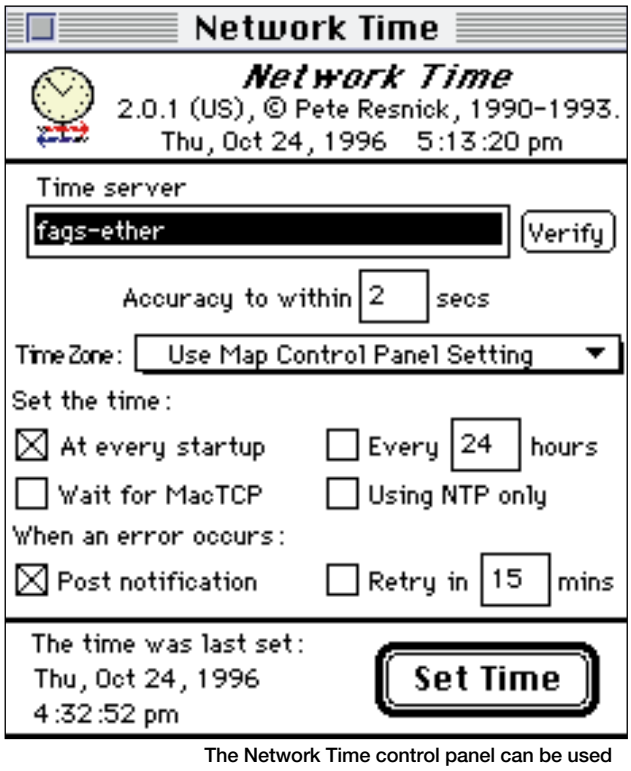
Setting up a newsgroup

Q. "*We'd like to create a newsgroup, called alt.speculation.universe, but we don't know how to do it. Can you help?*"

A. The rules for the creation of newsgroups differ, depending on which part of Usenet you want to create them in. For a newsgroup in the alt hierarchy, which is probably the best place for what you're proposing, you should use the alt.config group to discuss your idea. The first thing to do is to read the group for a few days, at least, and get a feel for the rules and how things are proposed. Even though the "alt" groups were originally intended as an "anything goes" area, things still have to be done in a certain way, otherwise many news servers will refuse to acknowledge the request to create a group.

Unless the creation message is processed properly, your new group won't appear on all the servers that could carry it, which means that few people will be able to post a message to it.

If you don't want to go to the trouble of creating a newsgroup, you should consider a mailing list instead. You could start this up on your own system without having to get the approval of anyone except your system's administrator.



The Network Time control panel can be used to update your Macintosh system clock from the internet (see "The correct time")

The correct time

Q. "*My friend's PC automatically corrects the time each time he connects to the internet. How can I do the same thing on a Macintosh?*"

A. You need the Network Time control panel, which can ask a computer anywhere

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on the internet for the time and update the system clock automatically. Ask your provider for the name of their time server, and enter it in the Time server box. You can then set the time when you're connected to the internet by pressing the Set Time button. To download the control panel, use the Macintosh Software Catalogue at www.nexor.co.uk which will give you a selection of download sites from which you can choose the one that's closest to you.

Taking up from where you left off

Q. "*I used to use bulletin boards, and whenever the telephone line failed during a long file download, I could always start again from where I left off by using Zmodem which automatically resumes from the middle of a file. Can I do anything similar with the internet? I've had some long file downloads stop after several minutes and my computer hangs up the phone if there's too long a pause.*"

A. Yes, you can, depending on the ftp program you're using because not all of them have the necessary functions, especially some graphical ones. There are two commands that can help you out: restart and reget.

The restart command is probably more common. The reget command is simpler — it merely begins to fetch a file starting at the end of the copy that's on your computer's hard drive. So if you're fetching a file called Picture.TIFF and saving it as newpic.tif, you'd use the command

```
reget Picture.TIFF newpic.tif
```

If the program you're using doesn't support the reget command you'll need to find out how much of a file you have transferred successfully, using the DIR command on DOS, or the Windows Explorer or File Manager. When you know how many bytes have been transferred, use the restart command. In this example I've assumed you have already transferred 12,317 bytes:

```
restart 12317
get Picture.TIFF newpic.tif
```

In other words, the restart command just tells the remote computer where to start off with the next file that you ask it to send. It's not as easy as using Zmodem from a bulletin board but at least you don't have to start again from scratch if you have an FTP program that supports either of these commands.

Stuck in the post

Q. "*I'm trying to set up internet mail on my OS/2 system, using Ultimail and sendmail. What do I need to put in the sendmail.cf file to deliver messages correctly? They merely sit in a queue and never reach the rest of the world.*"

A. To make sure your mail is delivered, you need to make sure the sendmail queue is being run from time to time, which you can do with the command sendmail -q when you're connected to the internet. If you run the command when you're not connected, you will receive error messages from the mail system. If you haven't been able to configure sendmail at all, the best advice is not to bother. The mail system on OS/2 Warp is based on a port of Unix mail programs and it really is too complicated to explain here, and is unnecessary for a single-user computer system.

You can find information on setting up the mail system for multiple users on Demon's ftp site, but if you're the only user retrieving mail via a POP mailbox, you should consider ditching Ultimail for something a little more straightforward which doesn't require you to configure sendmail.

One shareware program that you might like to look at is MR2/ICE, which can be found at nick.secant.com/mr2ice.htm. Although it doesn't support MIME, it can be used with add-ons and is much easier to configure than the standard OS/2 mail system. There's also a beta version of Netscape Navigator 2 for Warp, but the version which was available as this column was being written didn't support mail; future ones will. Check www.netscape.com for the latest details.

PCW Contacts

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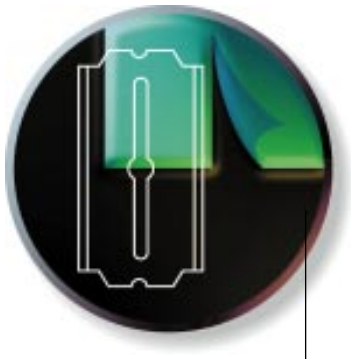


Books

Learn what's what in JavaScript, peer into the crystal ball of software development or let William Gibson show you a fictional future of advanced technology.

Javascript: The Definitive Guide — Beta Edition

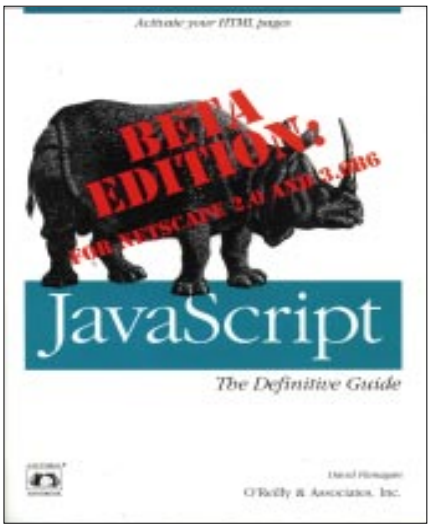
JavaScript is a deceptive addition to popular web browsers because the ballooning number of applets on the trendiest web sites would lead many to believe that it's a stable and well-established language. But this turns out not to be the case. When you consider how the three most popular web browsers (Internet Explorer 3.0 and Navigator versions 2.0.x and 3.0) all support slightly different versions of the language and that Netscape itself has not yet even published a formal language specification, it seems amazing that any of the applets work reliably at all.

Added to this are the various fortifications to JavaScript security which appeared between Navigator versions 2.0.1 and 2.0.2. Ultimately, JavaScript is going to make exciting web pages possible for "non-programmers". There's enough incompatibility around at the moment to drive even hardened code-junkies mad.

David Flanagan's book keeps you away from the most common bugs and compatibility black spots, while priming you in the writing of useful applets. It assumes a basic grounding in HTML and claims that no previous knowledge of programming is required. HTML authors will build up coding skills as they go along, but reading *JavaScript: The Definitive Guide* alongside another book which talks about writing neat, efficient, code is probably a better way to learn good programming techniques. On the other hand, if you require no more than a couple of if() and for() statements, the rather dry chapters on Lexical Structure, Variables and Data Types, Operators, Statements and Objects offer enough information for you to finish the job.

The core of the book lists all the JavaScript functions and methods using a clear format, and covering each object's properties in full BNF syntax for every JavaScript method in the context of HTML and, crucially, platform availability to allow you to keep your scripts portable. To help you get a headstart on Navigator 3.0 applets, the JavaScript reference section additionally covers those functions present up to Navigator 3.0B6. This book is better finished than the language itself.

Julian Evans



The Future of Software

The computer on your desk today has the potential for almost limitless power. The software running on that machine, however, may still be unchanged in five years' time. Before a shift occurs in the way we interact with our computers, a fundamental change must take place in the software we use. What those changes might be form the central theme of the group of essays in this book.

Interaction and open systems are the keys to advanced software development; but who will set these standards? The likes of Microsoft, it would seem, but that company also needs to make a quantum leap in the way it organises itself, and how it

Top Ten Books/CD-ROMs

1	Microsoft Windows NT 4 Workstation Resource Kit	Microsoft Press	£64.99
2	Inside The Windows 95 Registry	O'Reilly	£24.95
3	Java in a Nutshell: Desktop Quick Reference	O'Reilly	£14.95
4	Creating Killer Web Sites	Hayden	£41.50
5	Programming Perl, 2nd edition	O'Reilly	£29.50
6	Microsoft Windows NT 4 Server Resource Kit	Microsoft Press	£140.99
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produces its software in the future. This book hints at how this software will look.

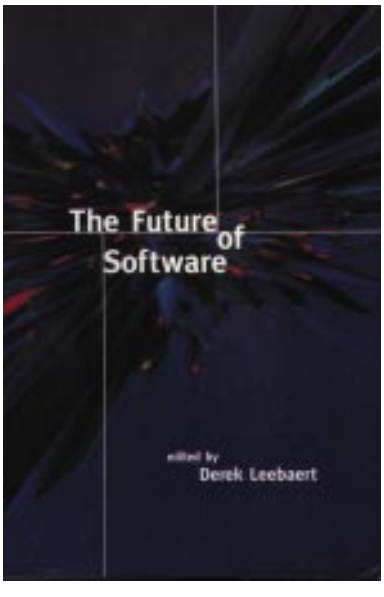
In the West, software applications look identical on countless machines. Word 7, for instance, is the same no matter where you use it. The Japanese however, have an open system. Software is specialised and customised to the end-user's specific needs. We are moving closer to the time when visual programming will mean just that: a way of creating your own custom programs, whenever you like, from pre-programmed units. The Japanese lack of standardisation may well give them a head start in this field.

Many areas of software development are tackled in this book. Fundamental issues are covered, such as the nature of computing power and its move to a complexity matched only by the human brain. Gustave Essig talks of "naturalware": "Natural language and human intelligence are attained through new naturalware design approaches, such as functional knowledge representation. The digital computer may achieve its destiny as the successor to the human brain in both complexity and capability." Great stuff; but the short history of program language development, the future of workgroup computing and why the Japanese feel they are in "software crisis" puts it into perspective. There are also excellent essays on other fundamental issues facing the software industry, like copyright law. One outstanding example looks at workgroup computing and is written as a piece of science fiction.

The future looks bright for all users if we can change some of our basic work practices and embrace the new millennium as the beginning of a new era in software development. We can perhaps look forward to a future where computers aid our everyday life, simply and efficiently. As Williams and O'Brien point out: "In today's society, information has become the oxygen of the whole process of interaction."

The final word should go to Scott Brown: "We have before us an opportunity that we can either capitalise on or squander." On the other hand, we may still be using the same buggy, flabby, marketing-driven software that today we know and love.

Dave Howell



Idoru

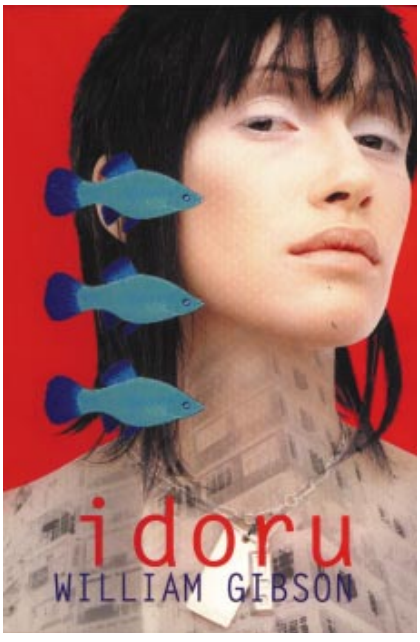
In his book, William Gibson departs somewhat from his usual formula and presents us with what many of his readers may find a disappointing read.

Idoru follows the lives of Laney and Chia. Laney is a media analyst whose synapses have been accidentally re-wired and now allow him to see patterns in the data that we all generate as we move through our lives. He is hired to provide damage control by the organisation that manages Rez, a rock music legend. Rez has announced that he will marry an Idoru. Nothing wrong with that, until you realise that an Idoru is nothing more than a software agent.

Chia is the hapless innocent thrown into this alien world and guides us through the melange. A fan of the band, she travels from the Seattle chapter of her fan club to Tokyo to investigate reports that the group's lead vocalist is about to commit this unforgivable act. The rock star fan club becomes almost Triad-like in its organisation and zeal. Gibson has once again taken something mundane and given it a new slant.

Laney's ex-employers, Slitscan, are media hyenas who construct sensational stories intended to reveal the seedier side of celebrity lives.They want Laney back in the fold, following his resignation over the suicide of one of their marks.

Gibson takes emerging technology and projects it into the future. Internet search technology has only recently emerged and Gibson shows us where this technological strand might eventually lead us. There is plenty here for hardened cyberpunks. Gibson still weaves a story that touches on many areas and doesn't over-play the technological elements to the detriment of



the central story. Shadowy organisations, streetwise kids and technology that remains tantalisingly unexplained and out of reach, all add layers to the quality of narrative that we have come to expect from him. Technology is prevalent but is not as conspicuous as in his earlier novels or those of Neal Stephenson, for instance.

For once, his vision is not of a dystopian society, but one where advanced technology is commonplace in people's lives and is accordingly taken for granted by them. Neither as lyrical as *Virtual Light* nor as new and raw as *Neuromancer*, but its subtlety nevertheless confirms Gibson as the master of his genre.

Dave Howell

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Author William Gibson
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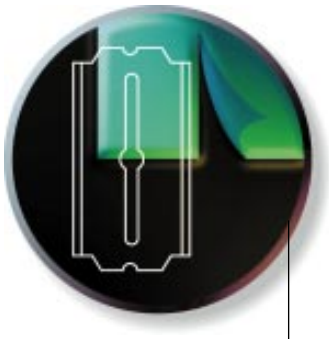


Talking loud and clear

"Testing, testing, 1, 2, 3." Tim Frost hails the "new era" of natural speech recognition, where your computer cuts through background noise to obey your instructions.

I learnt typing in my free-time doing A-levels (all the fourth form girls were in the typing class) and, as computing took off, it has proved invaluable. But I suspect that, regardless of how computer literate you are, from high-powered managers to school kids, the majority of you are two-finger typists. No matter how speedy your 200MHz Pentium can process the data, it can't speed up the entering of words and numbers.

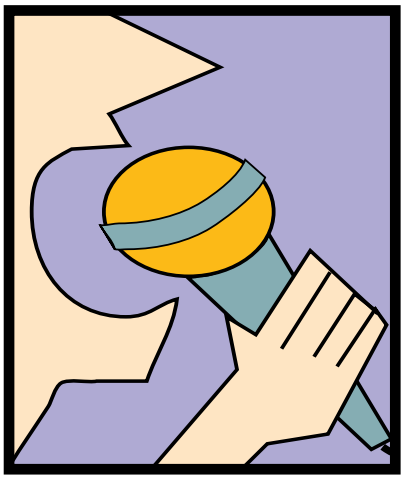
Despite its unsuitability for those not trained in its arcane rituals, the typewriter keyboard, designed to slow up typing, is still the only serious physical input device for computers. It might not be user-friendly, but its longevity has been guaranteed by two factors: everyone knows their way around it, and the lack of any real alternative.

There have been flirtations with finger keypads and writing surfaces, but as Apple will readily testify, these have not caught the imagination. It's not difficult to spot what the Holy Grail for human input is: watch any sci-fi movie and they're all doing it — talking to their computer.

A whole raft of companies is developing speech recognition, from the huge multinationals like IBM and Philips to specialist developers like Dragon Systems. And it is rapidly moving out of the era where programs need hours of training and still can only cope with a limited vocabulary spoken very carefully and deliberately. The new era hails "natural speech recognition", a complex mix of sound analysis, language models, sense, grammar and spelling checkers.

The system has to go through all sorts of hoops to take speech and turn it into text, with the main problem being one of keeping a decent level of accuracy. Any idiot can create inaccurate speech recognition.

The accurate speech recognition system needs to take a long stream of noise you have spoken into the microphone and recognise noises that correspond to a known pattern. This first stage uses statistical methods to match the received sound to a known phoneme, the specific



vocabulary of noises that speech is created with. Having established a set of most probable phonemes, it can create the combinations of letters that this set of noises would normally make — here comes the possibility for errors. Few speakers speak clearly: we drop consonants at the end of words and dialects wreak havoc with English as it is understood by a PC. There has to be cross-checking with an on-board dictionary to confirm a range of words that these phonemes could represent and then choose, statistically, which word is most likely to occur at that point in normal speech. From this stage on, it is a huge exercise in taking this string of statistically-likely words and seeing if they make credible sentences. If not, try the alternative matches and sound-alikes until there is a string of words that make real sentences and strings of sentences that make sense.

This takes a lot of processing power, and many systems rely on dedicated sub-processors to handle a big chunk of the work. As algorithms and models get more sophisticated, natural speech recognition is moving to software-only solutions that will run on a PC, admittedly a powerful one if you want to do it in Windows.

Some needs for this level of speech recognition are more obvious than others. It is already doing business in pathology labs where note-taking can be rather inconvenient. The legal profession likes it too: save half an hour a day of two-finger typing, at a lawyer's average hourly rates, and make an extra fortune by the end of the week. There is a small but increasing number of 24-hour phone information services that recognise speech rather than simple yes/no instructions. For PC users, the advantage is obvious: the ability to dictate text rather than wear out those index fingers to control the computer via keyboard and mice.

Even when the speech recognition algorithms have been fine-tuned and reduced to regular PC software, there will be barriers to overcome before you can call up your computer from anywhere in the room. There are many layers of analysis and processing needed to separate speech from background noise, and to work out if any of that speech is directed at the computer. Until then, it's on with the headsets, but for many this would be a small sacrifice. ■

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Glass act

Imagine a 3D image that hangs in space while you move around and look at it, like R2D2's video projections in Star Wars. Toby Howard reports on current — and futuristic — developments.

Although we live in a three-dimensional world, almost all our computer pictures are displayed in two dimensions, on flat screens. Imagine if we could create three-dimensional images that actually floated before our eyes, like the holographic video recordings projected by R2D2 in Star Wars. Researchers at Stanford University are bringing the reality closer, with a new display technology where true 3D images float in a cube of glass.

Making convincing three-dimensional images has long been a Holy Grail of artists and engineers. In the 15th century, Albrecht Dürer's studies of the laws of perspective laid the foundation for the creation of flat images that embodied a sense of depth. The technology behind the fifties craze for 3D movies ("See the hideous flying fingers of the swamp monster!") remains popular today. Glasses with green and red lenses enable each eye to see only the appropriate image of the two projected simultaneously on the screen. But the images suffer from cross-talk, so the left eye sees some of the right eye's image, and vice versa. This weakens the illusion, strains your eyes and gives you headaches.

A modern approach uses polarisation instead of colour filtering. Left and right eye images are projected onto a screen through polarising filters, the left image vertically polarised, the right image horizontally polarised. The viewer wears lightweight glasses with lenses being correspondingly polarised. Cross-talk is eliminated and if the system is well-aligned, you can see a full-colour 3D image floating in front (or behind) the projection screen. It is only when you reach out to touch the image that you realise there is nothing there.

3D display technologies are now appearing which allow the viewer to see a stereo image without wearing any special glasses. The principle of these "auto-stereoscopic" displays is still to present the eyes with left-hand and right-hand images, but the geometry of the display is such that each eye sees only the image intended for it. Several research groups are working on displays which can also track the location and orientation of the viewer's head, using ultrasound or infra-red beams, adjusting the images accordingly.

Although these techniques give exciting results, they are not creating true 3D images. They are presenting us with pairs of 2D images, and it is up to our brains to construct the true 3D scene they represent. Some people are better than others at doing this, and some people can't do it at all.

3D in the movies: (above) The Empire Strikes Back (from the Star Wars trilogy), and (right) Lawnmower Man

The latest and most futuristic development is the "volumetric display", which generates an authentic 3D image. The image hangs in space while you move around and look around it. This is R2D2 territory.

There are two volumetric systems, known as "swept-volume" and "static-volume". In swept-volume displays, the display screen is flat but it is rapidly rotated to sweep out a three-dimensional volume. If the screen is moved quickly, the eye can't see it; but if particular pixels on the screen are repeatedly switched on, in sync with the rotation, they are bright enough to be perceived as spots of light suspended in space (rather like the streaks of light you see when twirling a sparkler). A version of this technology, shown at the Electronic Imaging Symposium, used a rotating helical surface illuminated by a laser. It was known as Felix the Helix.

Many researchers believe the future of 3D displays lies with the static-volume display, which is a transparent grid of 3D pixels, or voxels. An unilluminated voxel is invisible, but when switched on, it appears as a spot of light floating in space. The prototype display recently announced by Elizabeth Downing and her colleagues at Stanford University works on this principle. It uses a block of transparent glass, in which voxels are illuminated when two invisible infra-red laser beams intersect. To create a complete image, the lasers are scanned around the volume, to repeatedly light up all the corresponding voxels, often enough to maintain a stable image. It's a clever technology, based on the physics which is never far away when discussing cutting edge technology: quantum mechanics.

The voxels in the display cube are created by introducing tiny amounts of rare-earth elements into the glass during its manufacture. Each rare-earth ion normally exists in its lowest stable energy state (call it state A). If it is illuminated by laser light of a suitable wavelength, it absorbs some of the light and jumps into a more excited energy state (B). It will stay in state B for a short time, before decaying back to state A. However, if it receives another jolt of laser light of a different wavelength while it is in state B, it gets even more excited, and enters state C. This is as excited as it can get, and after a few thousandths of a second it drops back to state A, emitting its surplus energy as visible light. The voxel lights up.

The current prototype of the display is tiny (the size of an Oxo cube) and monochromatic, the colour depending on which particular rare-earth element is used. Problems remain but the basis of the technology is proven, and there is a feeling that volumetric displays are on the verge of a breakthrough. ■

Hands On Contents

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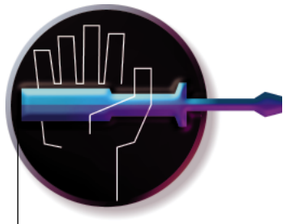

State of the **union**

In the final part of our four-part tutorial, Mark Whitehorn covers UNION, insert, update and delete commands.

I ended last month's tutorial by illustrating that while you can have all of the cars some of the time, and all of the people some of the time (in your SQL statement), what you really want to know is: can we have *all* of the people *all* of the time? The answer is "yes" but you need to make use of UNION.

UNION returns all of the records from two queries and displays them, minus any duplicates, in a single table. Thus:

```
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS RIGHT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo
UNION
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS LEFT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo;
```

produces:

Make	Model	FirstName	LastName
		John	Greeves
Aston Martin	DB Mk III		
Bentley	Mk. VI	Bilda	Groves
Ford	GT 40		
Ford	Mustang		
Jaguar	D Type		
Shelby	Cobra	Sally	Smith
Triumph	Spitfire		
Triumph	Stag	Fred	Jones

Clearly, the two answer tables that are produced by the separate SELECT statements must be compatible in order for the UNION to combine them sensibly. So:

```
SELECT CARS.CarNo, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS RIGHT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo
UNION
SELECT CARS.Make, CARS.Model,
EMPLOYEES.FirstName,
EMPLOYEES.LastName
FROM CARS LEFT JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo;
```

attempts to put text and numeric data into the same field and should fail. (In practice, some RDBMSs will allow this and convert the resulting field to the lowest common denominator, such as text.)

However, the result shown in Fig 1 *(page 269)* may not be particularly meaningful.

The first example I gave for UNION (combining a LEFT and RIGHT join) serves as an excellent example. However, it isn't the only way in which it can be used. Suppose that you have another table of sales people who, for whatever reason, are stored in a separate table from the other employees. Take a look at the following:

SALESPEOPLE

EmployeeNo	FirstName	LastName	CarNo
1	Fred	Williams	1
2	Sarah	Watson	4
3	James	Hatlitch	6
4	Simon	Webaston	
5	Sally	Harcourt	
6	Martin	Boxer	
7	Trevor	Wright	7

You want to throw a party for all the employees, and to include those sales people with company cars (because they have volunteered to drive the employees home afterwards).

You can use:

```
SELECT FirstName, LastName
FROM EMPLOYEES
UNION
SELECT FirstName, LastName
FROM SALESPERSON
WHERE SALESPERSON.CarNo Is Not
Null;
```

to yield;

FirstName	LastName
Bilda	Groves
Fred	Jones
Fred	Williams
James	Hatlitch
John	Greeves
Sally	Smith
Sarah	Watson
Trevor	Wright

You can also use UNION to produce a list of all employees and sales people who have company cars:

```
SELECT DISTINCTROW
SALESPEOPLE.FirstName,
SALESPEOPLE.LastName, CARS.Make,
CARS.Model
FROM
(CARS INNER JOIN SALESPEOPLE
ON CARS.CarNo = SALESPEOPLE.CarNo)
UNION
SELECT DISTINCTROW
EMPLOYEES.FirstName,
EMPLOYEES.LastName, CARS.Make,
CARS.Model
FROM
(CARS INNER JOIN EMPLOYEES
ON CARS.CarNo = EMPLOYEES.CarNo);
```

FirstName	LastName	Make	Model
Bilda	Groves	Bentley	Mk. VI
Fred	Jones	Triumph	Stag
Fred	Williams	Triumph	Spitfire
James	Hatlitch	Ford	Mustang
Sally	Smith	Shelby	Cobra
Sarah	Watson	Ford	GT 40
Trevor	Wright	Aston Martin	DB Mk III

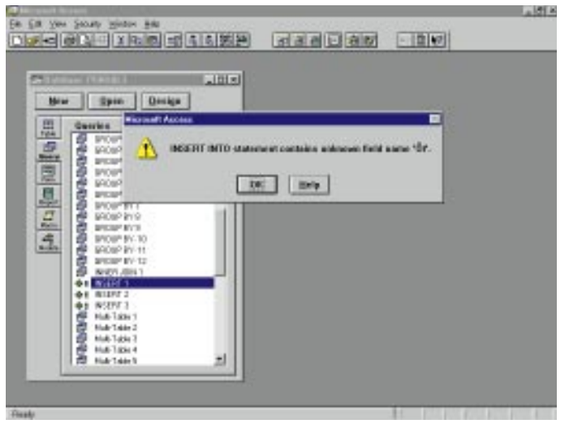

Fig 3 Error message generated when the first INSERT command is used too frequently!

SELECT summary

Suppose you import a table of data like this:

InvoiceNo	Foo
1	King
2	Baby Blue
3	Royal
2	Crested
5	Humbolt
2	Jackass

into a database and then try to make the field InvoiceNo into a primary key (*the Foo field is simply a shorthand representation of the boring information that would usually be displayed in an invoice*). This should fail because the field contains duplicate values. In this tiny table we can see them, but what if it had 50,000 records? With a little imagination, a query will find the errant records for us.

```
SELECT InvoiceNo, Count(InvoiceNo)
AS NoOfDuplications
FROM INVOICES
GROUP BY [InvoiceNo]
HAVING Count([InvoiceNo])>1;
```

InvoiceNo	NoOfDuplications
2	3

INSERT

Firstly, a brief note about the sample Access database which is provided. It is tempting to open each query as an SQL view, read it, and then look at the answer table by pressing the "Datasheet View button". This works for most of the examples provided but not for the INSERT queries. Press the "Run" button instead.

It is also worth bearing in mind that these queries will update the base tables, so you should be working on a copy of the database. In addition, remember that the tables have primary keys, so if you run the same INSERT query twice without deleting the additional record, the query will fail to run the second time.

As if all that weren't enough, please also note that I have encountered what appear to be "software anomalies" in using these queries in Access 2.0. The first example of an SQL INSERT statement will only run two or three times. Thereafter, even if the new record is dutifully deleted from the target table, the query will generate the error message shown in the screenshot, Fig 3. This is despite the fact that it hasn't been edited, or even opened for editing. Once this error message appears, the only way to get the query to run again is to delete the existing query, open a new one and type the SQL statement again.

SELECT is undoubtedly the most commonly used SQL statement, but we shouldn't forget the other members of the Data Manipulation Language (DML), INSERT, UPDATE and DELETE.

INSERT is used to add rows to a table. Thus the statement:

```
INSERT INTO SALES
VALUES (8, 1, "Jones", "Sofa",
"Harrison", 235.67);
```

This is not the only allowable construction. Indeed, Access will run this syntactical construction, but if you save the query, Access converts it to :

```
INSERT INTO SALES
SELECT 8, 1, "Jones", "Sofa",
"Harrison", 235.67;
```

Both constructions will add this record to the SALES table shown in Fig 2.

A slightly more verbose form is possible:

```
INSERT INTO SALES ( SaleNo,
EmployeeNo, Customer, Item,
Supplier, Amount )
SELECT 8, 1, "Jones", "Sofa",
"Harrison", 235.67;
```

which has exactly the same result. We can also add to specific fields:

```
INSERT INTO SALES ( SaleNo,
EmployeeNo, Customer, Amount )
SELECT 9, 1, "Jones", 235.67;
```

which adds a single record as shown in Fig 4.

But don't forget closure. Any operation that we perform on a table (or tables) in a relational database must have, as its result, another table. So suppose we write an INSERT statement like this:

```
INSERT INTO SALES
VALUES
(SELECT
        FROM SALES2
        WHERE SaleNo > 200);
```

The table SALES2 looks like that shown in Fig 5, and this SQL statement will add the five records for which [SaleNo] is greater than 200 to the SALES table.

Closure is important here because the statement within the brackets:

```
(SELECT
        FROM SALES2
        WHERE SaleNo > 200);
```

generates a table in its own right which is then INSERTED into SALES.

SQL is not always as standard as it should be. As another example, the syntax for this statement in Access is:

```
INSERT INTO SALES
SELECT *
FROM SALES2
WHERE SaleNo > 200;
```

UPDATE

The UPDATE command allows you to alter the values in fields. The general format is:

```
UPDATE tablename
SET Fieldname(s) = value
WHERE fieldname = value
```

although the WHERE condition is optional. Thus:

```
UPDATE SALES
SET Customer ="Smith";
```

will change Fig 6 to Fig 7.

As you might imagine, this command can be a little devastating in the wrong hands. The WHERE command generally limits its scope. So:

```
UPDATE SALES
SET Customer ="Smith"
WHERE Customer = "Simpson";
```

will act on the same initial table to produce that shown in Fig 8.

It is quite possible to use different fields in the SET and WHERE clauses. Thus:

```
UPDATE SALES
SET Customer ="Smith"
WHERE SaleNo < 5;
```

produces Fig 9.

Other variations are possible, and indeed common. For example:

```
UPDATE SALES
SET AMOUNT = AMOUNT * 1.1;
```

will update all the values in SALES.[Amount] by 10 percent, as in Fig 10. This sort of variant is particularly useful.

DELETE

The DELETE command allows you to alter

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the values in fields.

The general format of the command is:

```
DELETE FieldName(s)
FROM tablename
WHERE fieldname = value
```

although the WHERE condition is optional. Thus:

```
DELETE *
FROM SALES;
```

is a particularly powerful (not to say dangerous) statement since the output table looks like Fig 11. To be more specific, this command deletes the entire contents of the SALES table. *Please be aware of the consequences of any injudicious use of this command.*

More commonly (and less alarmingly) the command is used like this:

```
DELETE *
FROM SALES
WHERE [EmployeeNo] = 2;
```

which deletes two records and produces the table in Fig 12. Of course, closure comes into its own and we can write statements like:

```
DELETE *
FROM EMPLOYEES
WHERE EmployeeNo IN
(SELECT EmployeeNo
FROM SALES
GROUP BY EmployeeNo
HAVING COUNT (*) < 2);
```

which is neither friendly nor amiable, but effective in database terms. It deletes all employees from the EMPLOYEES table who have made fewer than 2 sales. The SALES table is unaffected, but one of our employees disappears from EMPLOYEES.

Bear in mind that this statement will try to remove employees who have performed badly, but the data dictionary may in fact prevent this deletion in order to preserve data integrity. This will depend upon whether Cascade Delete has been set between the two tables. In the sample database, the query will complete.

Summary

SQL is great, and if you spend any time at all with databases, it repays the effort required to learn it. One of the best ways to learn is to practise using it, which is why the sample database has 70 sample queries. However, you might also like to wile away your time on this brainteaser:

■ Question (and a free SQL diagnostic tool)

The two SQL statements below are perfectly legal. Both will run. The question is, which will be sensible? One of them will find all the records where the SaleNo is >200 and order the answer table by EmployeeNo and SaleNo. The other won't.

Q1

```
SELECT *
FROM SALES2
WHERE SaleNo>200
ORDER BY EmployeeNo, SaleNo;
```

or is it…

Q2

```
SELECT *
FROM SALES2
WHERE SaleNo>200
ORDER BY EmployeeNo AND SaleNo;
```

The only difference, to save you wasting time comparing them, is in the ORDER BY statement.

Answer: Q1 is correct and returns the table shown in Fig 13. Q2 returns the table in Fig 14 because it has a very odd construction:

```
ORDER BY EmployeeNo AND SaleNo
```

Despite appearances, this does NOT say "order the records by EmployeeNo and then by SaleNo". Instead, it says "evaluate the expression 'EmployeeNo AND SaleNo' for truth (the answer will come back as -1 [True] or 0 [False]) and then stack the records based on this value." You can prove this by adding the expressions which are being evaluated to the list of information that you want to see. Thus:

```
SELECT SaleNo>200 AS
['SaleNo>200'],
EmployeeNo AND SaleNo AS ['Emp AND
Sale'],
EmployeeNo, SaleNo, Customer
FROM SALES2
WHERE SaleNo>200
ORDER BY EmployeeNo AND SaleNo;
```

produces Fig 15. In all the records, the expression 'EmployeeNo AND SaleNo' happens to evaluate to -1, so the sorting has no effect.

If and when you come across an intractable SQL statement that runs but doesn't give you the answer you expect, then you can use SQL's own ability to show you the results of expressions as a diagnostic tool.

Figs 1-15

Examples to accompany part four of the SQL tutorial, covering the UNION, INSERT, UPDATE and DELETE commands, and the associated brainteaser.

Fig 1

Car No	Model	First Name	Last Name
		John	Greeves
2	Mk. VI	Bilda	Groves
3	Stag	Fred	Jones
5	Cobra	Sally	Smith
	Aston Martin DB Mk III		
	Bentley Mk. VI	Bilda	Groves
	Ford GT 40		
	Ford Mustang		
	Jaguar D Type		
	Shelby Cobra	Sally	Smith
	Triumph Spitfire		
	Triumph Stag	Fred	Jones

Fig 2

Sale No	Employee No	Customer	Item	Supplier	Amount
8	1	Jones	Sofa	Harrison	£235.67

Fig 3

SaleNo	EmployeeNo	Customer	Item	Supplier	Amount
1	1	Simpson	Sofa	Harrison	£235.67
2	1	Johnson	Chair	Harrison	£453.78
3	2	Smith	Stool	Ford	£82.78
4	2	Jones	Suite	Harrison	£3,421
5	3	Smith	Sofa	Harrison	£235.67
6	1	Simpson	Sofa	Harrison	£235.67
7	1	Jones	Bed	Ford	£453
8	1	Jones	Sofa	Harrison	£235.67
9	1	Jones			£235.67

Fig 2

Sale No	Employee No	Customer	Item	Supplier	Amount
3	2	Smith	Stool	Ford	£82.78
5	3	Smith	Sofa	Harrison	£235.67
213	3	Williams	Suite	Harrison	£3421
216	2	McGreggor	Bed	Ford	£453
217	1	Williams	Sofa	Harrison	£235.67
218	3	Aitken	Sofa	Harrison	£235.67
225	2	Aitken	Chair	Harrison	£453.78

Fig 6 — will change to…

Sale No	Employee No	Customer	Item	Supplier	Amount
1	1	Simpson	Sofa	Harrison	£235.67
2	1	Johnson	Chair	Harrison	£453.78
3	2	Smith	Stool	Ford	£82.78
4	2	Jones	Suite	Harrison	£3,421
5	3	Smith	Sofa	Harrison	£235.67
6	1	Simpson	Sofa	Harrison	£235.67
7	1	Jones	Bed	Ford	£453

…Fig 7

Sale No	Employee No	Customer	Item	Supplier	Amount
1	1	Smith	Sofa	Harrison	£235.67
2	1	Smith	Chair	Harrison	£453.78
3	2	Smith	Stool	Ford	£82.78
4	2	Smith	Suite	Harrison	£3,421
5	3	Smith	Sofa	Harrison	£235.67
6	1	Smith	Sofa	Harrison	£235.67
7	1	Smith	Bed	Ford	£453

Fig 8

Sale No	Employee No	Customer	Item	Supplier	Amount
1	1	Smith	Sofa	Harrison	£235.67
2	1	Johnson	Chair	Harrison	£453.78
3	2	Smith	Stool	Ford	£82.78
4	2	Jones	Suite	Harrison	£3,421
5	3	Smith	Sofa	Harrison	£235.67
6	1	Smith	Sofa	Harrison	£235.67
7	1	Jones	Bed	Ford	£453

Fig 9

Sale No	Employee No	Customer	Item	Supplier	Amount
1	1	Smith	Sofa	Harrison	£235.67
2	1	Smith	Chair	Harrison	£453.78
3	2	Smith	Stool	Ford	£82.78
4	2	Smith	Suite	Harrison	£3,421
5	3	Smith	Sofa	Harrison	£235.67
6	1	Simpson	Sofa	Harrison	£235.67
7	1	Jones	Bed	Ford	£453

Fig 10

Sale No	Employee No	Customer	Item	Supplier	Amount
1	1	Simpson	Sofa	Harrison	£259.24
2	1	Johnson	Chair	Harrison	£499.16
3	2	Smith	Stool	Ford	£91.06
4	2	Jones	Suite	Harrison	£3,763.10
5	3	Smith	Sofa	Harrison	£259.24
6	1	Simpson	Sofa	Harrison	£259.24
7	1	Jones	Bed	Ford	£498.30

Fig 11

Sale No	Employee No	Customer	Item	Supplier	Amount

Fig 12

Sale No	EmployeeNo	Customer	Item	Supplier	Amount
1	1	Simpson	Sofa	Harrison	£235.67
2	1	Johnson	Chair	Harrison	£453.78
5	3	Smith	Sofa	Harrison	£235.67
6	1	Simpson	Sofa	Harrison	£235.67
7	1	Jones	Bed	Ford	£453

Fig 13 — the correct answer

Sale No	Employee No	Customer	Item	Supplier	Amount
217	1	Williams	Sofa	Harrison	£235.67
216	2	McGreggor	Bed	Ford	£453
225	2	Aitken	Chair	Harrison	£453.78
213	3	Williams	Suite	Harrison	£3,421
218	3	Aitken	Sofa	Harrison	£235.67

Fig 14

Sale No	Employee No	Customer	Item	Supplier	Amount
225	2	Aitken	Chair	Harrison	£453.78
218	3	Aitken	Sofa	Harrison	£235.67
217	1	Williams	Sofa	Harrison	£235.67
216	2	McGreggor	Bed	Ford	£453
213	3	Williams	Suite	Harrison	£3,421

Fig 15

'SaleNo>200'	'Emp AND Sale'	EmployeeNo	SaleNo	Customer
-1	-1	3	213	Williams
-1	-1	2	216	McGreggor
-1	-1	1	217	Williams
-1	-1	3	218	Aitken
-1	-1	2	225	Aitken

The **wheel** thing

Not a creature was stirring, not even a mouse — or even that funny little wheel thing on Tim Nott's new Microsoft Mouse. Many happy hours were spent when he finally sussed it out.

I was very excited this month to receive a sample of the new Microsoft Mouse. This is the one that looks very much like the last. It's vaguely kidney-shaped but with a third thingy to twiddle — part-button, part-wheel, it sits between the two existing buttons.

Somewhat perplexed that the far end of the lead terminated in a PS2 (I think that's what it's called) plug rather than the screw-on 9-pin job that we know and love, I dug an adaptor out of the pocket of an old anorak and fired up the PC.

When Windows got to the bit when its internal checking orders "All those with mice take one step forward", I got the error message "Where do you think you're going, Mr Nott?" or words to that effect. Several changes of adaptor later, it was the same old story. Maybe, I thought, if I install the software first… (and no, I didn't RTFM as there was no FM to R — we press wallahs don't get that kind of cosseting). But still no joy, so I carried on with my distinctly shabby-looking Mouse Mark 2 and explored all the new Intellimouse goodies on offer apart from the wheel.

This brightened up the day considerably (it was about one o'clock), because I discovered all the labour-saving devices I'd missed since Windows 3.1 days. "Which way is up" is a clear winner. I'm left-handed and although, paradoxically, the asymmetrical MS mouse fits nicely in my left hand and I'm now well accustomed to using my middle digit as the main clicking appendage, I do tend to hold the thing slightly (well, very) skew-whiff.

Likewise, it's great to have "snap-to" back again — the trick that automatically moves the pointer to the default button of a dialogue box. And let's not forget the thing that causes the mouse pointer to disappear from one side of the screen and reappear on the other. Not much of an aid to productivity, but a superb practical joke.

The next stop was the brand new automatic lightup, as I call it. Waft the pointer over an icon or title bar, and it automatically grabs the focus without having to click. Cool, but for some strange reason often much slower than clicking normally. If you wish, you can also slow the pointer down automatically over icons and buttons, so I whacked this into gear as well.

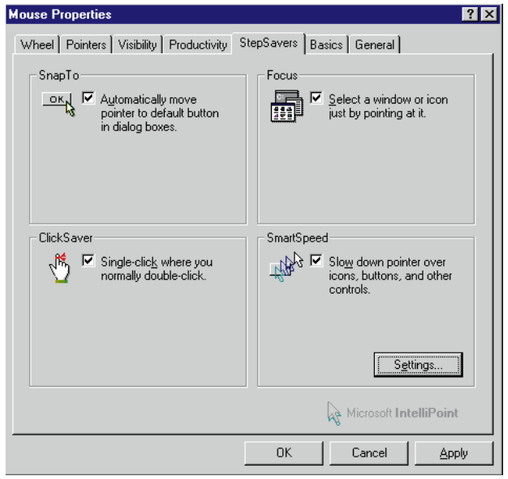

Fig 1 **New Intellimouse goodies. All but the wheel work with older mice**

Now, having watched someone with motor neurone disease struggle bravely and patiently to position the pointer exactly on a button or icon, I can appreciate the value of this. But it does strike me that Microsoft has gone a little over the top in the degree of the effect. At the slowest speed, it's rather like running across a field and suddenly putting your foot into a deep pit of mud. There you are, mousing away, when suddenly you grind to an abrupt halt. After picking the mouse up and scrabbling it repeatedly across the desk, rather like launching a toy car, the pointer will suddenly take off and whizz across the screen.

There's a happy end to the story, because the proper adaptor arrived and I was at last able to use the new mouse, complete with wheel. This does all sorts of wonderful scrolling, panning and zooming things. And very lovely it is too. But it only works in Explorer, Internet Explorer, and Office 97. The latter was still in beta at the time of writing, and although exciting and fascinating in its own right, wasn't yet at the stage where I'd forsake my existing software to use it for daily work. So, human nature being what it is, I spent many happy hours wheeling around Internet Explorer, then switching to the word processor and twiddling away ineffectually before realising for the umpteenth time "Oh, silly me, it doesn't work here, does it?"

Got those old MSDOS compatibility blues again…

But enough of my problems; how about yours? The "compatibility mode" problem continues to maintain a high chart placing.

A handful of quickies

■ Notepad is fussy about extension names that haven't been registered as Notepad files. Save a file, say, as MYPROG.BAS and you'll find you've actually saved MYPROG.BAS.TXT. Using the "View/Options/File Types" dialogue to register, say, .BAS or .SCR as Notepad files is one way around this, but you might well want to preserve the existing association in order (in these examples) to run Basic listings or scripts. The way around this is to save the file as "MYPROG.BAS", with double quotes around it, which avoids the gratuitous .TXT on the end.

■ Tom Fitzgerald wants to know how to change the "Tips of the day". Start Regedit, search for "Tips" and keeping hitting F3 till you see the tips in the right-hand pane. Double-click on the number of the tip you wish to change and an edit box appears. Speaking of which, thanks also to Nicholas Metcalfe, who sent a complete set of tips culled from Twin Peaks, and Mark Harrop with a set of seventies aphorisms from Brian Eno and Peter Schmidt. Now, that's what I call obsession. But no more themed collections, please, be they Douglas Adams, Star Trek (especially not) or Coronation Street.

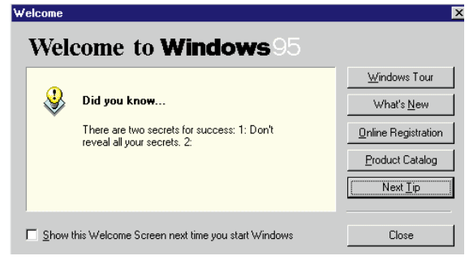

Fig 2 **Thank you, Robert Winstanley, for this "Tip of the Day of the Month"**

■ Alternative tips are still trickling in, but I need more, so get your imagination and/or plagiarisation going. For a pointer to the sort of thing I'm after, see Fig 2 for a very fine "Tip of the Month", stolen from Robert Winstanley's email signature.

■ You can cheat at Hearts in Windows 95, too (see the Windows 3.1 column on page 273 for the full story). Open the Registry and go to Hkey_Current_User/ Software/ Microsoft/ Windows/ CurrentVersion/ Hearts. Right-click in the right pane and create a new string value with the name ZB and the value 42. As with 3.1, Ctrl+Alt+Shift+F12 will then reveal your opponents' hands. You can also change the default names by adding string values for p1name, p2name and p3name.

■ Are you sure you want to: shut down the computer?; restart the computer?; restart the computer in MSDOS mode?; close all programs and log on as a different user?; get rid of this annoying confirmation? If your wish is the lattermost, create the following shortcut on the Desktop, Start Menu or folder of your choice. The command line should read RUNDLL32.EXE user.exe,ExitWindows. Note there is no space after the comma or in ExitWindows. You'll get the usual prompts asking if you want to save any open, changed, files. If so, you can cancel the command, too. Apart from that, you're out. Finished. Shut down without further ado.

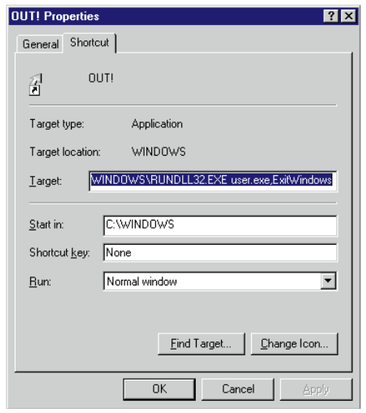

Fig 3 **A quick getaway from Windows**

To briefly recap, this is the one where, seemingly out of the blue, your hard disk performance declines drastically and Control Panel/System/Device Manager shows that your disk controllers have been demoted to "MSDOS compatibility mode".

Mark Hewitt had this problem when installing Windows on an old-ish Elonex P90. Phil Kelly, of Elonex support, pinpointed the problem instantly and precisely. The Neptune motherboard does not support Plug and Play (P&P). But Win95 installs it anyway. Solution? Remove P&P from Device Manager, restart the PC, then manually "Add new hardware", select PCI Bus. Restart again and all should be well.

David Ingham had a similar problem after assembling his own PC. This time it was an unnamed hero at Microsoft tech support who stayed behind for 30 minutes after close of play to establish that the combination of Award BIOS and Windows 95 PCI-IDE drivers was the problem. New drivers from the motherboard supplier cured the problem. Robert Winstanley upgraded from 3.11, experienced the same

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problem and tracked it to SYSTEM.INI. So look for DEVICE= lines that refer to files with the .386 extension. These are "legacy" devices from 16-bit days and can cause compatibility mode (and other) problems. Try commenting the line out by preceding it with a semicolon.

Order! Order!

Grahame Slope came up with an interesting challenge: "*How can I get the shortcuts in my StartUp folder to execute in a particular order?*" I really tried on this one. It seems to make no difference how, or in which order, the icons are displayed. Nor does the alphabetical order seem to matter. At one point, I thought I'd cracked it with the creation dates of the shortcuts but this, too, was a red herring. Stranger still, restarting the PC would sometimes load the applications in a different order. Then I remembered the other way: the load= and run= lines in WIN.INI. In conventional wisdom, the first runs a program minimised, the second in a normal window, and the trick is to leave a space between each item. For example:

```
run=notepad.exe charmap.exe
calc.exe
```

This actually worked, at least initially, but it must have been a fluke as re-ordering the same items or adding more didn't run them in the order specified.

Then of course, there's the other, other way, which is far more high-tech and involves editing the Registry to add new string values to:

```
HKEY_LOCAL_MACHINE\ SOFTWARE\
 Microsoft\ Windows\
 CurrentVersion\ Run
```

So I went there, did that, and needn't have bothered. Sure, the programs ran, but not in any perceivable or consistent order. So moving on to the other, other, other way, I remembered that you can start a Windows program from a DOS prompt. I must admit, I'd never appreciated why you might want to: even if you don't have a shortcut for the program, it's quicker to launch it from the "Run…" command. But it figures that if you can start a Windows program from the DOS prompt, then you should be able to do it from a batch file.

With trembling fingers I put together a batch file in Notepad, each line launching a different Windows application. I created a shortcut to this file in the StartUp folder, and, just to be flash, edited the properties of the shortcut to close the DOS window on exit. I restarted Windows for the umpteenth time that day. And guess what? It works. Certainly, it's slow and kludgy, but preliminary testing shows that the batch commands are processed in the order listed. Obviously the department of obfuscation and bloody-mindedness slipped up there.

While I'm winning, I'll pass on the following ancillary tips. If you want the batch file to open a folder, or an associated file, use the "Start" command. And if long file or folder names are involved, enclose them in double quotes. Here's an example:

```
c:\windows\calc.exe
"c:\Paint Shop 4\psp.exe"
c:\windows\notepad.exe
c:\windows\charmap.exe
start "c:\Program Files"
start c:\bootlog.txt
```

This starts the Calculator, then Paintshop, Notepad and the Character Map, opens the Program Files folder and opens bootlog.txt in Notepad.

■ By the way, Chris Marriott's SkyMap, mentioned in my *Windows 3.1* column, is on this month's CD-ROM in 32-bit flavour as well, in the same Zipfile: Skymap.zip. Happy stargazing and a happy Christmas, to y'all!

A glimpse of Christmas stocking

As I write this, the sun is shining and the window (strictly non-™) is wide open. The trees are turning gold and there's a faint smell of woodsmoke from the first log fires of the season. At the top of my page it says "January issue, 1997" so it must be Christmas. And you thought Windows 95 was confusing. Anyway, in accordance with the time-honoured tradition believed to date back to at least 1995, here is my Christmas wish-list.

But first, did last year's wishes come true? These all concerned various tedious aspects of the Windows 95 interface. One wish was that Microsoft Office would take a leaf out of Microsoft Windows' book and put the filename before the application. In fact, I've beefed about this at great length so I won't bore you further, except to say that the beta of Office 97 I saw still doesn't do this but adds the refinement (at least in Word) of putting your name between the application and file name. Just in case you forget it, I guess.

Tiled Windows in Office Binder didn't happen either, and nor did the ability to add files such as Notepad or Paint to a binder. Another wish was to reinstate the JPEG and GIF Quickviewers that appeared in the betas of Win95 but not in the final cut. A little progress here — you can get an enhanced Quickview (for money) or view them in Internet Explorer (free). My last wish was "Please give me the patience and understanding to get to grips with the way Windows 95 saves settings". A little progress here, too: the free Tweak UI gizmo has an option for globally enabling or disabling "save settings", so at least you can stop all the folders you left open from opening again. But it's far too little, too late: saving general and particular folder settings is still largely a matter of guesswork and pot luck whether a folder opens in list view, icon view, with or without the toolbar, and so on. So let's put that as this year's number one.

This year, I wish…

1. Let's have explicit folder menu options for "Save this folder settings" and "Save these settings for all folders below this one". And nipping the inherent contradictions in the bud, the latter will produce a confirmation dialogue if this includes a previously-saved "one-off". And while we're about it, a separate setting for re-opening (or not) folders, which were open when you quit.
2. Let's have a totally easy and effective way of securing a standalone PC. This, after all, is the age of the family computer. We need to be able to restrict access not just to applications and settings but to folders, too.
3. And can someone explain to me what I have to do to persuade the PCW cover-mounted CD that I already have the Acrobat viewer installed and working?
4. Returning almost to where I started; a patch to make the new mouse wheel work in all applications.

Bugwatch

Remember the Windows 3.x Calculator bug? Well, you'll be delighted to learn that Windows 95 has one all of its own. Switch to scientific view, and multiply 0.57 by 100. If you don't get 57, that isn't a bug, that's you. Now press the INT key. What this should do is return the integer part of a number — that is, everything to the left of the decimal point. Whoops! Yes, I get 56 as well, with 0.58 and 0.28 giving similar results. There may well be others. In each case the Inverse INT function, which should return all to the right of the decimal point, gives 1. So at least there's some kind of method to the madness.

PCW Contacts

Tim Nott can be contacted either by post c/o *PCW* or by email at **timn@cix.compulink.co.uk**

Multiple mayhem

Multiple configuration options, low level Windows security, and the search for a cure for the dreaded RDS. All dealt with before Tim Nott posts his Christmas wishes up the chimney.

Martin deLoughery emailed me from Bahrain (he must be a devoted reader because *PCW* costs more than ten quid there) with a warning on multiple configurations, as discussed in my October '96 column.

He writes: "*I stopped using the DOS multiple configuration option thing aeons ago. Why? Well, the prime reason is that once you have set the whole thing up, would you be likely, thereafter, to never add another device to your system or do anything that will* not *require a change to either CONFIG or AUTOEXEC? I think not, and if you like your memory to be optimised (as I do) you will find that MEMMAKER and your nice new multiple-configuration CONFIG and AUTOEXEC will not be cheery bedfellows. Try running Memmaker with your config and autoexec setup for multiple configuration and see what happens.*"

Certainly, he has a point. However, it should be possible to run MEMMAKER on each individual configuration, save the results as CONFIG and AUTOEXEC.001, 002, 003 and so on, and combine the results into a single, multi-choice CONFIG.SYS and AUTOEXEC.BAT. That's not to say I'd really like to try it, so point taken.

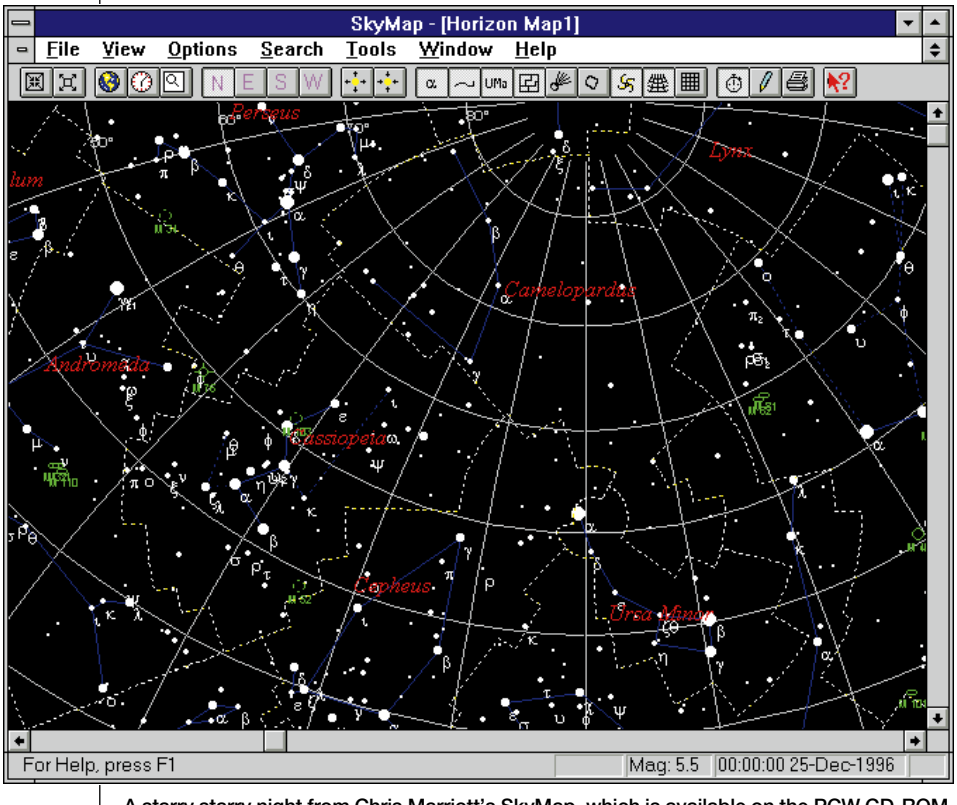
Another observation came from Tim David, who complained that he couldn't get more than nine menu choices, but I think he was just showing off.

Stargazing

"We are all in the gutter, but some of us are looking at the stars." So wrote Oscar Wilde who, with remarkable prescience, also coined "Either that wallpaper goes or I do" shortly before his last and fatal GPF. But I digress.

As star watching seems appropriately seasonal, check out Chris Marriott's SkyMap on this month's cover-mounted CD. Chris, who comes from Culchet in Cheshire, has created a rather splendid planetarium for Windows. Tap in your latitude and longitude and you'll see not just stars in the east, west, south and north, but planets, asteroids, comets and deep sky objects. It's on the CD-ROM as Skymap.zip, which contains 16-bit and 32-bit versions. It's a 30-day shareware evaluation version. The full program shows over 250,000 objects.

■ Registration costs £29.95 (plus P&P and VAT) from the Thompson Partnership on 01889 564601.



A starry starry night from Chris Marriott's SkyMap, which is available on the PCW CD-ROM this month (Skymap.zip)

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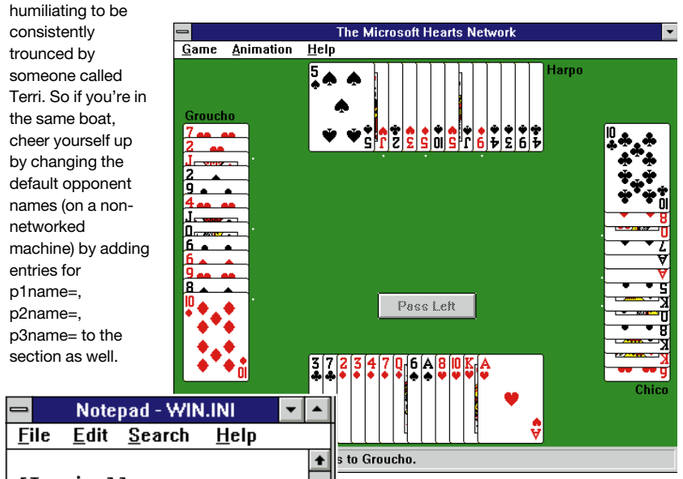
If at first you don't succeed — cheat

If you're an honourable and upright citizen, skip this bit. Not to put too fine a point on it, this is how to cheat at Hearts.

Add ZB=42 to the [hearts] section of WIN.INI. (If you don't have a [hearts] section, create one including the square brackets.) Restart Windows. Play Hearts. Hit Ctrl+Alt+Shift+F12 — borrow some fingers if necessary — and watch as all your opponent's cards become visible.

But even having done that, I still find I lose — I don't really mind, but I do find it rather humiliating to be consistently trounced by someone called Terri. So if you're in the same boat, cheer yourself up by changing the default opponent names (on a non-networked machine) by adding entries for p1name=, p2name=, p3name= to the section as well.



Above
Cheating at cards...
Left
...and how to do it

Jerking around

On a more positive note, our man in Bahrain has a rather novel use for CHOICE.COM (Hands On Windows 3.1, July '96). Being forced to share a PC with somebody he uncharitably (but probably justifiably) refers to as "the jerk", he first created two directories, "Hisstuff" and "Mystuff", and copied his PROGMAN.INI and *.GRP files into "Mystuff". He then created a custom Program Manager for the jerk, giving more limited access before copying this set of PROGMAN.INI and *.GRP to "Hisstuff".

Using CHOICE with the /N and /T switches to suppress the prompt and timeout to a default, AUTOEXEC.BAT would always copy the jerk's Program Manager settings to Windows, unless he pressed a certain key (but unknown to him) during the crucial few second's pause. "*It never mattered*" writes Martin, "*what he did to his program groups (lest he should have learned how) and never mattered whether 'Save settings on exit' was turned on, the jerk always got the same screen every time he started Windows. Crude, but at that level, effective security.*"

Roger Pearson had a problem with Program Manager. It could be minimised or maximised but when restored "*…it appears as just a short title bar, and I cannot change its size or position from the top left corner of the screen. I have printed out all the obvious files but cannot find any differences between this machine and another.*"

This sounds very much as if PROGMAN.INI has been nobbled. Open it in Notepad and you should see a section headed [Settings]. In this will be a key named Window= followed by five numbers. The first two give the position, in pixels, of the top left corner of the window. The next two give the size, again in pixels, and the last should be 1 for restored, 2 for minimised and 3 for maximised. When you restore Program Manager from either minimised or maximised, it will return to the position and size determined by the first four numbers. If these are unfeasible, you can get the problem Roger describes.

The simplest solution is to delete the entire line, or comment it out by putting a semicolon in front. Program Manager will then resort to something restored sensibly in the middle of the screen.

Recursive Syndrome update

A problem that's proving very popular is the mysterious Recursive Directory Syndrome (RDS), as reported in this column in November. This is where Norman Burnell reported that the contents of C:\GAMES was replicated in C:\GAMES\GAMES and so on *ad nauseum*.

A Mr (or Ms) Butterwick reported: "*I also had RDS, along with other things such as not reading a file that it had just verified as being saved, files not existing which File Manager or a DIR reading had shown to be in perfect condition, and CHKDSK reporting thousands of lost clusters or cross-linked files. After numerous checks and tests, it finally turned out to be a faulty motherboard — wish I'd thought of that before trashing a perfectly good hard disk.*"

Colin Mower had a similar problem, although "*…it only existed when I tried to open up my CD-ROM drive in File Manager when there was no CD in the drive. I would get thousands of directories reported as existing on an empty drive! This caused no problems in the running of Windows or DOS, until I tried to back up my hard disk. MSBackup would try and read all of these 'ghost' directories, and complain rather bitterly after about the 200th empty one. I tried everything to resolve this problem, but the only way I got out of it was to re-format my hard disk and start from scratch.*"

Chris Paget came up with a way of reproducing the problem. "*All it takes is ten seconds with Diskedit or an equivalent. Having run Diskedit, go to the root directory, pick a sub-directory and change the cluster number to zero. When you quit, that sub-dir will now point back to the root, and voila! a recursive sub-directory, exactly as described.*" Unfortunately, he doesn't tell us how to reverse the process. Not having Diskedit or a spare PC to hand, I managed to resist the temptation to try this out. This one, I feel, will run and run, but hopefully we might find a solution.

Dear Santa...

And so to my Christmas wish list. Last year, one moan was directed at multimedia applications which insist you change screen resolution before running. So hats off to Talking Books and Broderbund whose children's titles do this automatically, without having to restart Windows, and then neatly change it all back on exit — but only under Windows 95, alas. However, under 3.1 the titles will run without changing resolution.

Likewise, in response to another moan, there's a refreshing trend for games and entertainment CD-ROMs to copy nothing but an icon to the hard disk.

Another wish (which made the charts two years running) was that memory prices would drop in accordance with other PC components such as processors and hard drives. I'm delighted (well, not that delighted, as I bought all my current memory before the drop) that this has come true, and after two years of £20-plus, a megabyte of RAM is, at the time of writing, less than £5 although it seems to be creeping up again.

A third wish that came true (or very nearly so) was for a UK version of Encarta. I've had to settle for a "World English" edition but this does a great deal to redress the over-emphasis on US sport, natural history and culture in favour of more important things such as cricket, nightingales and the Archers. And yes, it runs under both 3.1 and 95, but just to show you can't win them all, it installs 4.5-11Mb of files to your hard disk.

Another wish was for a superfast and stable video card. And I think I've found one — a Matrox Millenium that provides 16.7 million colours in up to 1,280 x 1,024 resolution. It seems solid as a rock and, something that's been on my wish list for a long time, lets you change resolution and screen depth without restarting Windows. And that's not just 95 but 3.1, too. And it's fast. In fact, it's too fast, as selecting or dragging text in Word is impossible if the startpoint and endpoint aren't on-screen at the same time: everything scrolls far faster than I can react.

And so to this year's wishes...

1. Can I have an option to slow down scrolling in Word 6 (and 7) please, so I can get my dragging and dropping back under control?
2. Can I ask printer manufacturers to take a rest from developing? I keep reading of colour inkjets that get ever better and ever cheaper. But just when I've set my heart on replacing my six-year-old (but still going strong) Star dot-matrix with the latest technological marvel from Hewlett-Packard (for instance), Epson, Canon or Lexmark — to name but four at random — move the goal posts. And by the time I've found the definitive best buy from that lot, guess what? HP has moved them back again.
3. But if I've really got to force a decision, then can I have an HP 690c, please. And could I possibly have it a bit early so I can produce those amazingly original Christmas cards I've been meaning to do for the past five years?
4. And while we're in an artistic vein I'd like one of those dinky little Artpad graphics tablets with the cordless pen, from Wacom. I had an all-too-brief loan of one and fell deeply in love.
5. Last but not least, a repeat of last year's wish. Keep developing for Windows 3.1!

Tumpty-tumpty-tumpty-tum... Microsoft discovers the true meaning of culture

PCW Contacts

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Driller **thriller**

Oh, the horror: staring at broken end-pins on one of your drives. When it happened to Dale Strickland-Clark, he got down to some soldering and writing of batch routines for backup.

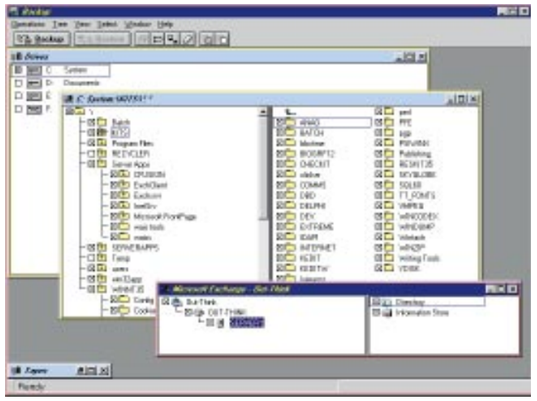
I had a bit of a panic a short while ago. While reassembling my server, having just added a new 2Gb SCSI drive to work alongside the two 1Gb drives already there, I was having some difficulty getting the SCSI cable back into one of the old drives. Just a little bit worried, I decided to pull the drive out and investigate the obstruction. I broke into a cold sweat when I discovered that I'd bent almost flat the two end pins on the drive's SCSI connector. They were so bent, in fact, I knew that if I attempted to straighten them again, they'd break off.

I tried anyway and they broke off, but I gained a little satisfaction from being right. I considered my options. The chances of fixing the pins back on were pretty slim. I did have a backup of the data, and with a new drive installed, I could get away with simply restoring the data onto that drive. However, I had other plans for the new drive, and furthermore, the thought of dumping an expensive bit of kit because two of the cheapest components had broken off bugged me. I decided to try fixing it.

I trimmed away a section of the plastic surround with a tiny circular saw attachment on a modelling drill and exposed the base of the two severed pins. Then, with a small soldering iron, some fine solder and a steady hand, I carefully re-attached the pins to the connector. I can't hope to express the drama of the situation and the relief when, with it all connected together again, my server booted without complaint.

Although I was already fairly conscientious with my backups, this episode brought home the vulnerability of data and the large scope for mislaying it.

Backing up systems is one of those tedious jobs you postpone at your peril. NTBackup shipped as part of NT is adequate for emergency use, but provides only the barest control over what is backed up and no help with automating the job. Consequently, running the backup is a bit of a chore. The greater the effort required to take a backup, the more likely it is to be skipped on a busy day. I've had a couple of goes at writing batch routines to take some of the pain out of the procedure, but tape cycling was still manual and far too much rubbish was being backed up, taking the data onto a second tape for a full backup.



The standard NTBACKUP that comes in the box with NT is easy to use and provides control over what is backed up down to file level, but only if you run each backup by hand. It's hopeless to automate and won't back up the Registry from other systems over a network. Not recommended for use in production

My backup requirements are modest, with about 10Gb online around the network, the most important slice of that being the 4Gb on the NT Server. Much of the rest is just installed software and it wouldn't be a disaster to have to recreate it from scratch. My Sony DDS tape drive will manage between 6 and 8Gb to a tape, depending on the level of compression achieved.

There are some slight complications, too. Not all the data can be backed up by a simple file-level routine. Send an SQL/Server .DAT file to tape while the database system is running and there's an excellent chance that the data will be unusable. You must at least shut SQL/Server down first. The same applies to Exchange Server and many other server applications.

The example batch routine, BU2.BAT (Fig 1) shows one possible approach to automating a backup procedure using the standard features in NT.

While this routine simplifies running a backup, it doesn't automate it. For this we can use NT's Schedule service (Fig 2). These commands entered into a console window will schedule three different types of backup to run at nine o'clock each evening. You then just need to make sure you have the correct tape in the drive each evening.

Before spending too much time attempting to mould NTBACKUP into your ideal backup system, however, it is worth considering the alternatives. There is an extended version of NTBACKUP, called "Backup Exec for Windows NT", from Seagate Software (a company formed from several mergers including Arcadia, the name some people may still associate with this package), and Cheyenne Software has an NT version of its popular NetWare backup package, ARCserve.

ARCserve for NT is a very comprehensive system and there are numerous options to extend its capabilities. In its basic form, it allows flexible control over what is backed up and, with its built-in scheduling, when the backup is run.

But there are some drawbacks. Cheyenne has shunned NT's own tape drivers in favour of its own. This means you have to disable the tape devices to NT, preventing any other standard software accessing them. Re-enabling the tapes requires a reboot of NT. This prevents, for

p278 ➢

Fig 2

```
at 21:00 /every:su "c:\batch\bu2.bat sunday"
at 21:00 /every:m,t,w,t,f  "c:\batch\bu2.bat daily"
at 21:00 /every:s "c:\batch\bu2.bat weekly"
```

Fig 1 Automating backup using standard NT

This backup routine uses standard NT commands and none of the new features of NT 4. The Sleep command is found in the resource kit but is optional. The series of Echo commands at the beginning are a handy way of identifying command parameters without introducing case sensitivity and allowing abbreviation of long parameter names. For example, "incremental" can be abbreviated to "inc". A few frequently-used parameter combinations have been given names for convenience, such as "Sunday", "Daily" and "Weekly". This has been implemented by having the batch file simply call itself again with the expanded parameters when one of the combined names is used.

```
@echo off

echo /daily | find >nul /i "/%1" && bu2 incremental 4mm append
echo /sunday | find >nul /i "/%1" && bu2 incremental 4mm overwrite
echo /weekly | find >nul /i "/%1" && bu2 normal 4mm overwrite

setlocal
set tape=na
set butype=na
set append=na

echo /normal | find >nul /i "/%1" && set butype=normal
echo /incremental | find >nul /i "/%1" && set butype=incremental
echo /differential | find >nul /i "/%1" && set butype=differential

echo /small | find >nul /i "/%2" && set tape=1
echo /large | find >nul /i "/%2" && set tape=0
echo /4mm | find >nul /i "/%2" && set tape=1
echo /qtrinch | find >nul /i "/%2" && set tape=0

echo /append | find >nul /i "/%3" && set append=/a
echo /overwrite | find >nul /i "/%3" && set append=

if %tape% == na goto error
if %butype% == na goto error
if .%append% == .na goto error

Echo Backup type %butype% to %tape% %append%

Net stop "Allaire Cold Fusion"
Net stop "World Wide Web Publishing Service"
Net stop mssqlserver

rem —- Link to share on NT workstation
Net use x: \\dale-pc\drive-c

rem —- Link to share on Windows 95 workstation
Net use y: \\heidi-pc\drive-c password

ntbackup backup c: d: x: y: /v /b %append% /hc:on /t %butype%
 /tape:%tape% /e /l "c:\temp\backup.log"

Net use x: /delete
Net use y: /delete

Net start mssqlserver
Sleep 10
Net start "World Wide Web Publishing Service"
Sleep 10
Net start "Allaire Cold Fusion"
```

(continued over...)

Top You control ARCserve from a comprehensive array of buttons, but not all of the rest of the system is as easy to get to grips with. Above With ARCserve, you can back up just about anything you can think of. If it's not handled by the standard package, there's probably an optional *agent* to add support to back it up

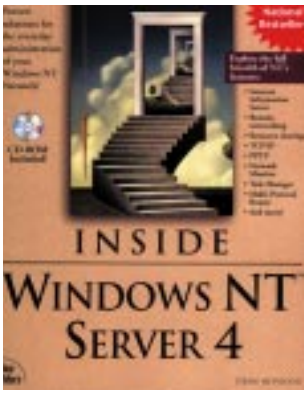
```
pushd temp
findstr /b /i /l /v /c:"Directory" backup.log >"backup summary.txt"
del backup.old
rename backup.log backup.old
start notepad "backup summary.txt"
popd

goto exit

:error
echo Syntax: bu2 daily ^| sun ^|\ weekly
echo Syntax: bu2 {normal^|incremental^|differential}
 {small^|large^|4mm^|qtrin} {append^|overwrite}

:exit
endlocal
```

example, using the SQL/Server DUMP command to backup database tables, or using NTBACKUP to write tapes to send to other sites (the latest service pack gives ARCserve the ability to read but not write the Microsoft tape format used by NTBACKUP).

Cheyenne has no plans to change this regime, claiming it is to maximise performance. Having seen ARCserve backing up to a Storage Dimensions MegaFlex TapeArray (four DLT4000 tape units of 40Gb capacity each) at nearly 100 megabytes per minute, I'm not in too much of a hurry to argue. But I wonder if the standard NT drivers would be dramatically slower. I'm hopeful of the chance to find out.

Books

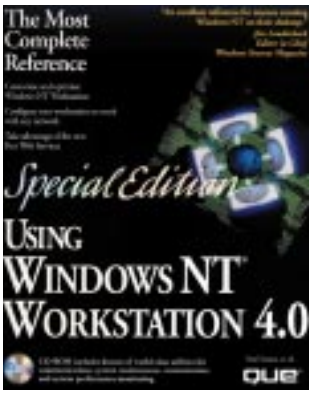
Inside Windows NT Server 4
Author Drew Heywood
Publisher New Riders
Price £46.99 (incl VAT)



No matter how well you thought you knew NT, it's a fair bet you'll soon learn something new flicking through these pages. This is a very readable and extremely informative volume, and covers a huge amount of ground all in good detail. It sticks to explaining things that aren't obvious, avoiding the torture of describing each menu item. Complex subjects, such as security, are illustrated sufficiently clearly for you to wonder why they were ever thought complex in the first place.

If you work with NT Server, start clearing two inches of shelf space now.

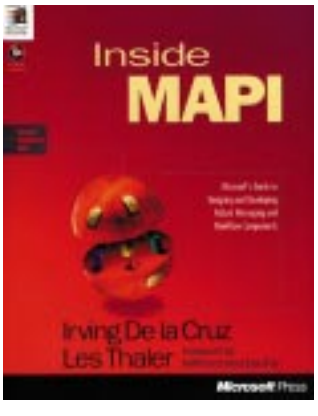
Special Edition Using Windows NT Workstation 4.0
Author Paul Sanna et al
Publisher Que
Price £46.99 (incl VAT)



With more or less equal weight given to using WordPad and configuring SNMP, it's difficult to identify the target readership of this book. Whoever buys it is going to have to lug around several chapters for which they have no use. That said, it's a book that will take the novice through to a good degree of competency — given sufficient time. The authors (all thirteen of them) clearly wanted to leave no gaps in the subject matter and they have succeeded, even covering Microsoft Internet Mail and Internet News which are not included in NT as standard.

A very comprehensive reference, but slightly spoiled by pointless and obvious detail.

Inside MAPI
Author Irving De la Cruz, Les Thaler
Publisher Microsoft Press
Price £37.49 (incl VAT)



If you thought MAPI was a simple API to send and receive messages, you haven't looked recently. The MAPI supported by Microsoft Mail and for which a VBX provided an easy interface for Visual Basic, has been renamed Simple MAPI — and for good reason. The MAPI you'll find in NT and used by Exchange is a very much more complex beastie.

This isn't a book for the faint-hearted. You'll need a good grounding in messaging systems, Microsoft's COM architecture and C++ to get much beyond chapter two. This is Microsoft's definitive reference on the subject so there's lots of code samples to help you get through it, and

Dear Santa...

1. NT has come a long way since its birth, and it might seem a little ungracious to ask for a better user interface so soon after we've already had one, but a) I'd like each folder to remember where I had it on the screen, which view I used and how the icons were arranged; b) I want some MUCH faster ways to get to the folder I'm interested in, both through Explorer and from File Open and Save dialogue boxes; and c) Closer integration between console windows and the desktop. For example, I'd like to be able to quickly make a selected folder the current directory in a console window.
2. 1997 is going to be NT's year, but the take-up is going to be hindered by hardware manufacturers being slow or reluctant to bring out peripheral drivers for NT. The Windows Driver Model will address this problem but that's at least eighteen months away. I'd like to see tape drive, scanner, CD-ROM writer manufacturers and others wake up to the potential and write some native NT drivers.
3. The mouse is an ergonomic disaster. It's too far from the keyboard and it doesn't do enough when you get there. The cable snags on everything and notebook manufacturers have universally failed to emulate it in the space available to them. It's time for a rethink. When the ideal solution is invented, it will be wireless or part of the keyboard, it will have at least a button for each finger so you can do more without returning to the keyboard, and it won't need a square foot of desk space to itself. It should also double as a telephone handset so I can just lift it to my ear when it squeaks and have a shaver attachment for when I get up late. Oh, and there will be NT support for it — first.

PCW Contacts

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All **together** now

Chris Bidmead claims things are changing for Unix users. Then again, he said the same in 1993... Still, he remains optimistic: 1997 could finally see some Unix togetherness.

One of the things this column asked Santa Claus for last Christmas was for the Unix community to get its act together. Something along these lines — dare I hope — is actually happening. In February, we saw the coming together of X/Open and the OSF to form The Open Group, followed in September by a declaration of intent from Uniforum to join the amalgamation.

My dentist tells me that amalgam is a metallic mixture that sticks in your teeth and goes hard and almost inert except for trickling out a few, probably poisonous, Hg ions that may actually help keep decay at bay. A not-too-unfair description of the massed forces behind Unix in the past, you might think (I couldn't possibly comment...). But things are changing.

One sign of this change is the way The Open Group is welcoming the Open Unix effort to its bosom. Open Unix is a development of Lasermoon's Linux-FT, now under the aegis of Caldera (more about this at www.caldera.com). And I see that CDE, The Open Group's Common Desktop Environment, has now arrived on Linux. CDE was part of the initial Unix COSE initiative that was proposed in March of 1993, but the fact that it's taken three years is hardly the fault of Linux.

I mentioned the COSE initiative in the first of these columns, written in September of that year, and was somewhat sceptical about it at the time (see panel). Indeed, it wasn't long before COSE began to look like just a knee-jerk reaction against Microsoft's NT, with little muscle behind it. It would be ironic if Caldera's Open Unix became the focus for The Open Group's so-called Single Unix. Perhaps this threat of rivalry is one reason that SCO has decided to make its own Open Server flavour of Unix freely available to anyone not using it for commercial purposes.

So, I promised to get hold of a copy of the SCO freebie and report back to you. It took rather longer than I anticipated, and the CD and its accompanying pair of boot diskettes arrived too late for evaluation this month. Next month, if all goes well....

COSE in 1993

In September 1993 I wrote: "COSE... sounds terrific. You'll be able to sit down at any Unix workstation from any manufacturer and instantly be at home, in the same way that Windows users are today. Better still, applications will run 'right out of the box' on Unixes on the same processor, and to move a COSE app across to a different processor will only need recompilation — no tweaking and twiddling with the source code..."

And porcine domesticated livestock will become airborne. Alas, the Unix world has promised various forms of togetherness in the past but has still managed to remain a mass of twisty passages, all different. Fingers crossed.

PPP to the internet

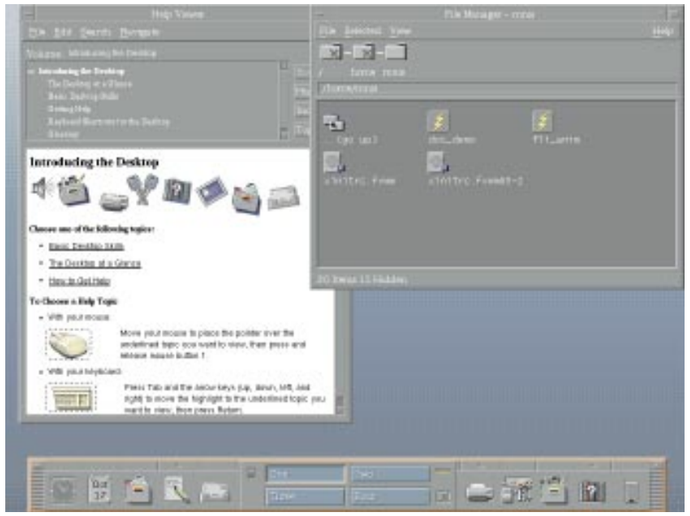
A debate among journalists on one of the electronic forums recently discussed the relationship between information that goes out in columns like this, and information that is available on the internet. I could, I suppose, stuff this column with rejigged wisdom culled from the internet; certainly, internet FAQs and newsgroups are a very important source for me. The Truth is Out There (if you can filter it out from the junk)

But I'm starting to assume that if I can get to it, most of you can get to it too. So my role isn't to relay wodges of publicly accessible material. What you get in this column is my own personal adventure/quest/struggle to get a few particular things done, and generally to make sense of what I call "grown-up computing". I do give pointers to what I think is good and useful information on the net, and occasionally I may summarise. But mostly I take it for granted that cyberspace is something we share.

I realise this may not be true for everybody. But if you're adventurous enough to be running a flavour of Unix, or to contemplate doing so, you're probably adventurous enough at least to be thinking about connecting to the internet. My minimim recommendation: get yourself an email address.

Unless you're one of the lucky few with a fibre cable coming in off the street, you're likely to connect through a serialised network connection called PPP (Point to Point Protocol). In October, I passed on some tips for tracking what's happening with PPP once you're making connections through it. The month before, I explained in general what PPP is, apropos some problems I'd been having with my own internet connnection. Last month, I included some screenshots of GateKeeper, the graphical front-end that drives PPP on my NeXT machine.

If I'd realised I was going to turn the PPP saga into a serial, I'd have been more methodical about it. Notably missing so far is a discussion of how to set about making



Left The Common Desktop Environment. This is what you see when you first log in to Linux Pro Desktop, available from WGS (www.linuxmall.com). It's uncannily like the AIX desktop — which of course is the point of CDE. The Front Panel (long strip at the bottom) is also a relation of OS/2's Launchpad

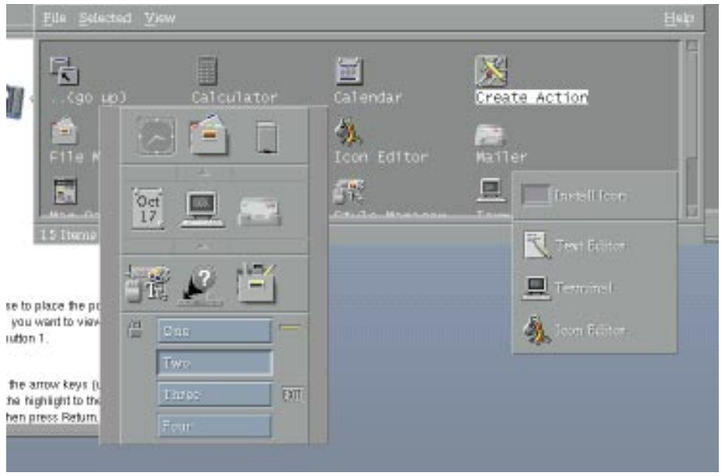
Below A closer view, with the Front Panel transformed to a more vertical shape. The panel to the right is a tear-off from the main Front Panel. As with OS/2 the icons are objects, which can be allocated behaviours with simple scripting. For full details, see the WGS home page

the connections through PPP to your internet service provider in the first place.

The arrival on my desk of a shiny new Surfer modem from Psion-Dacom has prompted me to work on PPP afresh. The Surfer comes bundled with software and trial accounts for Pipex, CompuServe and AOL and, as such, represents a real bargain for mainstream computer users. But for those of us who see the so-called mainstream as just a shallow but loud babbling brook, this isn't a lot of use.

Because all the software is for just one operating system, or maybe two — Windows and the Mac — does this mean that Unixen should just give up? Sometimes the answer, alas, is yes. I mentioned PinkSlip a couple of months ago. That's a proprietory protocol that Pipeline uses, which only works with their own (Windows) software. AOL does something similar, which again locks you into AOL's own software, and therefore into Windows. Yes, it's completely crazy, and I gather these companies have seen the error of their ways, but it's going to take a while for them to fix it. So until then, Pipeline and AOL aren't in our frame.

Generally, you'll find ISPs offering a PPP connection, but one of the biggest, the IBM Global Network, still only does the older SLIP (non-)standard. You can cope with SLIP from Unixes like Linux, but I decided to put that aside for the moment and concentrate on PPP, which is fast becoming the all-embracing standard for TCP/IP down a serial line, and it will also cope with other transport



protocols like IPX.

I find the best way to tackle vendors offering PPP is just to plunge straight in with a modem and a simple utility like tip or cu that lets you talk to your modem. You could trying ringing their help desk, although I hope you fare better than I did (see page 282).

Before you can get onto the remote system, you obviously have to make a physical connection by dialling up. Once you're connected, the ISP needs to know a) who you are (username), and b) whether you really are that person (password). There are some more complicated schemes that do further checks (on your hostname, for example) but I haven't come across them. So basically you need to get the name and the password across somehow.

The "standard way" is an ASCII exchange before you bring up PPP. If this is what the ISP needs (Netcom UK works this way), you can do this manually from any terminal-type program that talks down a serial line to your modem. In what follows, I'm using tip on my NeXT machine. (I notice that the manual for dip on my version of Linux carries this succinct comment at the end: "BUGS: This program does not work very well.")

First, type ATZ and hit carriage return. You should get "OK", which means the connection to the modem is working. Then you dial:

```
<modem initialisation stuff> ATDT
 <phonenumber>
```

Assuming you've got the baud rate

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right, this should bring up a prompt string that says something like "Login:". Baud rate and initialisation strings used to be a major hurdle in the good old days, but modems at each end of the line seem to have become a lot more intelligent about getting this right automatically. If in doubt, keep it simple.

Then you do the authentication exchange. Typically, this goes:

```
Login: <yourname>
Password: <yourpassword>
```

where the stuff to the left of the space on each line is the incoming string (from your point of view) and the stuff to the right is your response. Netcom UK requires you respond to Login with:

```
uk,ppp,<yourname>
```

Demon adds a third prompt where it asks you for the protocol "Protocol:" and you respond PPP. One reason for doing this manually is so that you can see exactly what the prompts are.

If this dialogue is accepted, the next thing you'll see (maybe after a cheerful "HELLO", which might require you to pause for a few seconds) is a stream of garbage characters. This is the remote PPP throwing binary at you. At this point, you bring up PPP at your end and the exchange continues in binary. You're connected. Now you can go away and write a script that does this automatically.

Here's a tip: have pppd ready to run in a second shell window. This way you can bring it up quickly — sometimes the ppp at the remote end will sulk if it doesn't connect to you right away. And don't forget (as I did when I first tried exploring this) that the utility is called "pppd" with a "d" on the end (because it's a daemon).

A faster and more secure way of carrying out the connection is with PAP (Password Authentication Protocol). If the ISP is set up to do PAP, you start up PPP the moment the modem tells you you're connected, and leave it to PPP to carry out the authentication. You can still get as far as bringing up PPP manually, but from then on, you depend on PPP to do the rest.

How does PPP know what to do? The PPPs on most of the Unix boxes I've come across derive from the free version originally written by a team lead by Drew Perkins (you should see the name come up when you run pppd). These accept a command line parameter "+ua <filename>", where <filename> points to a file that contains just two lines, <yourname> on the first line and <password> on the second line. When the ppp daemon sees the +ua parameter, it knows to carry out PAP using the stuff you've put in the filename.

Those are the basics, and at this level, if you treat PPP itself as a sort of black box, they really are that simple. The documentation supplied with your system should be enough to take you to the next stage of automating the whole process with the chat scripting utility. If, for some reason, things don't work, or you are a glutton for PPPunishment, O'Reilly's *Linux: Network Administrator's Guide* includes a whole chapter on the subject.

The main pppd command will also tell you a lot about ppp. Be careful with all that stuff you can put in the command line or in an options file. The modems (or more likely, "virtual modems" like Ascend boxes) that ISPs are using these days are very smart and seem to be used to treating you as very dumb. The simpler you can keep it at your end, the more likely you are to connect. For example, you'll discover that PAP is a two-way street, allowing you to say back to the remote system: "OK, that's who I am. Now let's check who you say you are, and who you really are?" My recommendation is not to bother with any of this, unless you have a lot of time on your hands...

ISP helpline howler

Here's what happened when I rang the support line of a well-known ISP.
Me: Do you do PAP or require a pre-PPP ASCII dialogue?
Help Desk: What operating system are you using?
Me: Does that matter?
HD: We need to know so we can tell you how to set up your software.
Me: I'm not asking how to set up my software. I'm asking what your software requires so I can supply it. I'm doing it manually to start with. When I understand what's happening, I'll be able to set it up for any operating system and/or application that I want to use.
HD: (After a long pause) Did you say "manually"...?

It seems that any wisdom they have about making the connection seems to be encapsulated into particular applications and operating systems. The help desk staff I've talked to certainly aren't daft, it's just that they seem not to have thought of it in terms of what's going on underneath.

Pick up on Pick

My diversion in the October issue about Dick Pick seems to have triggered off a stream of email from fans of the operating system. Some of it is nostalgic, but much of it reminds me that Pick is still a force to be reckoned with, even if it does get a pretty low profile in the mainstream computing press today.

Mark Chapman (mark@wwsltd.demon.co.uk) runs an outfit in Tunbridge Wells that specialises in software for Homecare and Nursing Agencies. He's a Pick user — he describes it as his "favourite database". Pick Systems, he tells me, claims to have become more businesslike since the demise of its founder, "which seemed to mean shedding staff by the cartload." Mark, too, remembers a night out he had with Dick Pick. "I thought he was an incredible bloke. He was well into middle age and yet a serious thrill seeker. I had thought all his jet skiing etc was just really naff marketing, but the guy was genuinely wacky."

Chris de Vaney (chris@wsel.lu) is another computer professional who responded enthusiastically to the Pick namecheck. "Oh boy, do I remember the Pick system. I evaluated it twice for large UK installations in the early eighties, and I just didn't believe how powerful it was. The natural language query interface still hasn't got anything to match it 13 years later!" Chris's story about an estimated two-year engineering application backlog for a broadcasting organisation being covered in just over eight working days using Pick, is typical of the mail I've been getting. Thanks, everybody. Over the three years I've been doing this, the column has already spun off standalone columns about OS/2 and Windows NT. Maybe Pick will be next? Or maybe I'll legitimately be able to write more about Pick here (a few readers write in to complain if I wander away from purest Unix for a moment). Because rather like NeXT, the main thrust now for Pick, Mark Chapman tells me, is to host it as an environment on other operating systems. And the entry-level version of Pick is to be hosted on, guess what? Linux.

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What a Warper

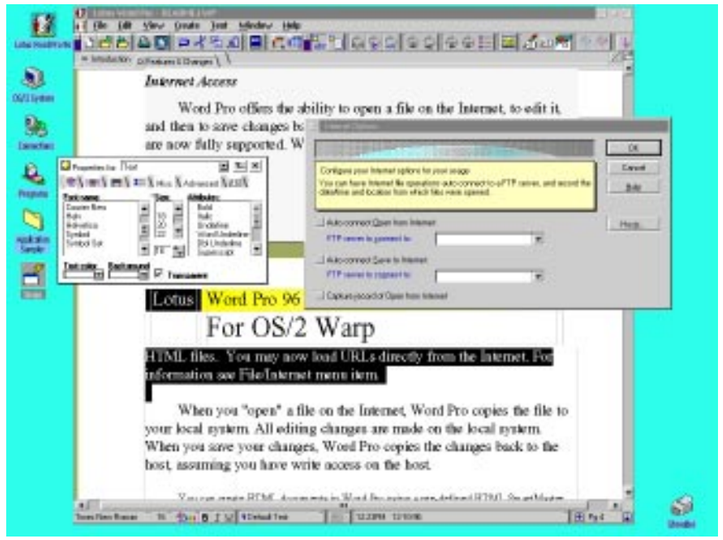
Terence Green reports on how Warp 4.0 (in beta) has fared on his system. With its new components and three new CDs, he recommends it as a must-have upgrade.

I have been running Warp 4.0, the product formerly known as Merlin, during its beta phase and I have to recommend it as a must-have upgrade for anyone running Warp or OS/2 as their desktop operating system. It's a superb network client and an excellent choice for the connected end user.

Warp 4.0 includes great internet connectivity with Java support in the operating system. A native OS/2 version of Netscape Navigator didn't make it into the box, but will follow shortly as a free download.

As the US Warp 4.0 code I'm using now has a speech model designed for US accents, I've not yet installed the VoiceType navigation and dictation support. I'll do that when UK Warp 4.0 has become available (due, at the time of writing, by the end of October) and report in my next column if my deadline permits.

What is apparent from the US shrinkwrap is that simply upgrading an existing Warp 3.0 system to Warp 4.0, without adding any of the new bundled components, has very little effect on memory and hard disk space, yet improves both performance and usability. The proviso is that your existing system is a 486 or better with at least 16Mb RAM if you're running a connected desktop, whether you're connected directly to the network or on a dialup connection.



A word processor for Warp. Lotus WordPro 96 for OS/2, still pre-release, emerges slowly

New CDs and BonusPak

In addition to the new components of Warp there are three, new, bundled CDs and an updated BonusPak. The new CDs are NotesMail, the Device Driver CD and the Application Sampler. The Sampler contains around 80 trial versions of OS/2 applications including StarDivision's StarOffice 3.1, an office productivity suite with word processor, spreadsheet, graphics, multimedia and internet capabilities.

The Sampler CD also contains MGI PhotoSuite for OS/2 imaging software. MGI used the Open32 developer extensions to port their application from Windows 95 to OS/2 Warp. Lotus helped develop Open32 which they're using to develop SmartSuite 97 for OS/2. At the beginning of October, Lotus put pre-release versions of WordPro and Freelance Graphics up for free download from www.lotus.com on the SmartSuite product page. So finally, a Lotus OS/2 suite is in prospect, and one based on a quite different approach than the original idea of a parity release floated by Lotus some years ago. What a long, strange, trip it has been.

The BonusPak CD contains native OS/2 applications (updated from Warp 3.0 versions) including IBM Works, HyperAccess Lite, and FaxWorks. There's also a new Remote Support for the OS/2 Warp package which enables IBM technical support, or company support, teams to offer remote support, maintenance and upgrade for Warp 4.0 users.

WarpCentre

Without doubt, Warp 4.0's user interface is the most user-friendly and functional graphical interface in a desktop operating system today. It precisely reflects desktop and drive structures, and does so automatically. Thanks to the new Lotus-inspired WarpCentre action bar you can have one-click access to all your programs and files without having to clutter up the desktop with lots of pointers.

As you can see from the screenshot on page 286, the desktop and hierarchical folder structure is presented on the WarpCentre menu exactly as you arranged it. Furthermore, there's no need to worry when you move things around or re-arrange the desktop, because Warp keeps track of this for you.

The user interface is visually pleasing, with new, coloured, tabs in the properties (formerly settings) notebooks, and the new Warp Sans system font. And, of course, all the existing usability features remain. Every folder can be individually configured with details such as its own background image or pattern, which can be a useful way of identifying different projects.

To further speed up access, WarpCentre (actually WarpCenter in the US spelling) also allows you to stack up "trays" of program and folder objects on the taskbar. Using Trays is like having multiple task bars. And, if

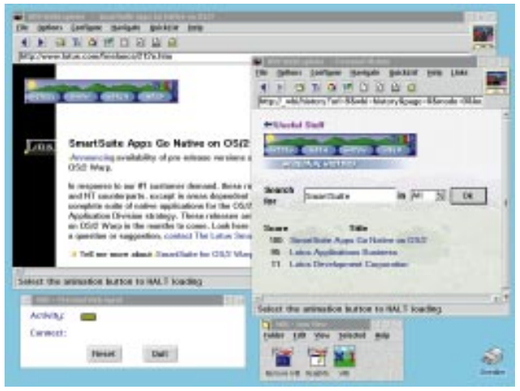
On this month's cover-mounted CD

Netscape Navigator 2.02I for OS/2 beta 1
Although it is incomplete and the shipping version should be out by the time you read this, I've nevertheless popped it onto the cover CD as a taster.

The fully-functional shipping version of Netscape Navigator 2.021 for OS/2 should be available now from Netscape and IBM's web sites *(http://home.netscape.com)*

Adobe Acrobat beta 3 for OS/2
This beta is not time limited, as was the case with the prior version. Adobe's licence permits me to pass it on, but the web site from where I downloaded it does request registration of interest. So if you like the beta and want Adobe to know, do visit www.adobe.com and register your interest.

WBI (Web Browser Intelligence) or "Webby"
Terrible name, but it's one of several really interesting demonstrations of upcoming technology from IBM that can be found at www.alphaworks.ibm.com. Other Alphaworks demos include a Java applet development kit for Windows 3.1 and the NetRexx scripting language for Java.



This technology demonstration of an intelligent agent from IBM is available for OS/2 and Windows 95. It tracks your internet usage, and creates a sorted and indexed audit trail *(www.alphaworks.ibm.com)*

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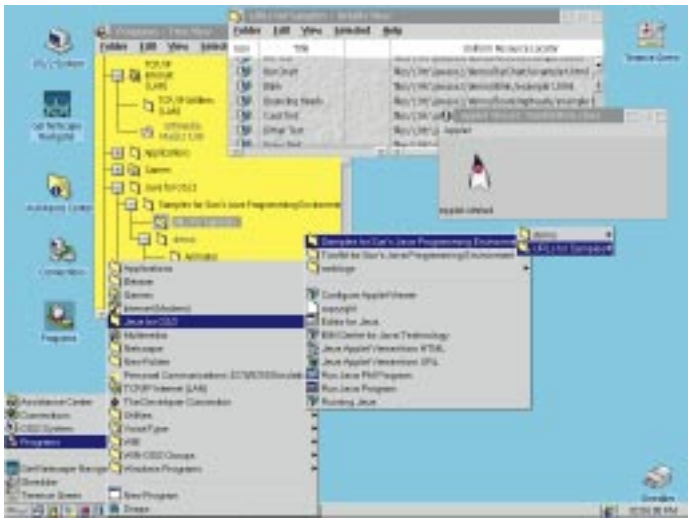


Of all the graphical user interfaces for PCs, Warp 4.0's truly object-orientated WorkPlace Shell with WarpCentre is the most user-friendly and functional desktop

you have become used to the LaunchPad, it's still there but now called the Toolbar.

Install

Another aspect of usability is the ease with which Warp 4.0 can be installed and maintained. For large installations there is a remote network install facility which can be used to automate batch or new user installs and upgrades. Incidentally, Warp 4.0 will install over any previous OS/2 system and it now includes Microsoft Windows applications support as standard. There's no longer a separate Red Box for Windows version.

One of the main problems with Warp 3.0 and earlier versions was the way the install would bog down and fail on some systems. Usually, these were systems with IDE CD-ROM drives, specific IBM PC models, systems with dodgy memory, or PCs with IRQ clashes which weren't apparent under Windows or DOS.

Support for plug-and-play

Warp 4.0 includes support for plug and play, a graphical Hardware Manager (essentially a graphical version of the RMVIEW command), and a bunch of more device drivers including a separate CD with hundreds of drivers and links to the internet sites of hardware vendors where the latest drivers can be found.

Warp 4.0 plug-and-play support autodetects hardware during the installation process, but this can be turned off if required. If you've ever played with plug and play you might have discovered that it can sometimes go wrong, particularly if there's a mix of plug-and-play and legacy adaptors in the PC. By pressing Alt-F1 and selecting the new F6 option from the ensuing menu, you can disable the auto-detect feature and manually install drivers for problematic hardware.

A brief Warp 4.0 contents list

We're running out of space again and haven't begun to explore Warp 4.0 behind the scenes, so here's a quick rundown of what's in it. (Coverage will continue in next month's column unless the editor requests a full review. His email address is in the front of the magazine if you should feel the urge to let him know how much you appreciate his support for OS/2 coverage.)

- VoiceType for OS/2 Warp
- File and print client for OS/2 and Windows (3.x, 95 and NT)
- Novell NetWare client
- Remote Access Client
- Java (runtime and developer tools)
- Internet connectivity
- Web Explorer browser
- Plug and Play
- Power Management
- Multimedia
- TrueType
- Systems Management (client and agent)

Dear Santa...

Last year, I wanted internet access for schools, a ThinkPad on which to run Warp, and a new home PC. Shortly thereafter, an IBM PC company person wondered why I wanted to run OS/2 when Windows 95 ran so well on the ThinkPad. I used a Toshiba to test Warp mobility instead.

On the home PC front, I eventually built my own thanks to the plummeting price of RAM and Pentiums. I purchased a TMC Pentium/Triton 2 motherboard from Simply Computers for £99 and two 16Mb SIMMs for under £150. The rest of it came from a PC whose disk drive had died in June, and the motivation was the motherboard which died in August. It has worked like a dream, with Warp 3.0, and Warp 4.0 shrinkwrap installed without a hitch, and now runs perfectly.

Three wishes for 1997

The internet story rumbles on, so this year my three wishes are:

1. A return to common sense in internet reportage.
2. Better ISDN support in Warp.
3. Britain to stop frustrating a worldwide ban on landmines. These weapons kill civilians, in the main, and a disproportionate number of kids who think the landmines are toys and pick them up.

The whole idea of the internet as a global information resource is being perverted by trash journalism. For a better perspective on the subject, read *Bandits on the Information Highway* by Daniel J. Barrett, published by O'Reilly & Associates and distributed through International Thompson (www.thomson.com) in the UK. A good point Barrett makes is that it is far easier to spend time with your kids directing them to the good things on the internet, than it is for anyone, governments included, to exert control over computers which may be running in another country with different laws.

The internet is a global forum. It contains nothing that you can't find elsewhere, but it does provide a simple way of discovering information of all types. Parents shouldn't let their kids venture out into the street without offering them guidance on road safety.

PCW Contacts

Terence Green can be contacted either by post c/o *PCW* or by email at **tgreen@cix.compulink.co.uk**

Scroll **on...**

Why is there a lack of live scrolling in Word? Tim Phillips has good and bad news. How to make your signature look good on a fax or email, plus hints and tips and the macro club.

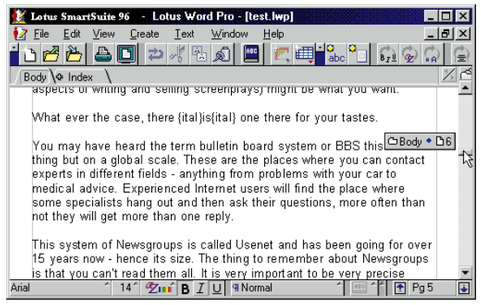
Alexi Cawson mailed me from Brighton to raise an interesting point about how you navigate around documents.

"*I have one thing to say about it which continually puzzles and perplexes me — the lack of 'live scrolling' in Word. When you scroll by putting your mouse on the 'button' in the scroll bar and dragging up and down, you can't see the page scrolling up and down with your mouse movement. You get 'Page 1' and 'Page 2' etc, yellow indicators, but this is hardly a compensation.*"

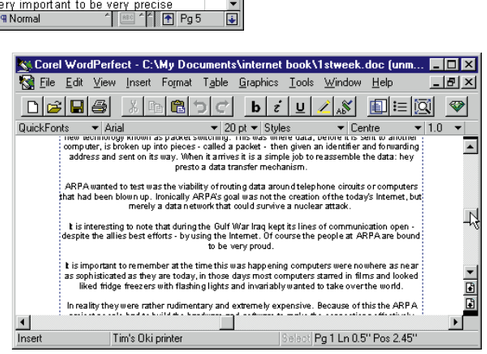
As Alexi points out, you get live scrolling in Notepad, Netscape and Wordpad. Indeed, it would be hard to imagine a web browser, for instance, that didn't give you a "live" scroll. Well, Alexi, there's bad news and good news.

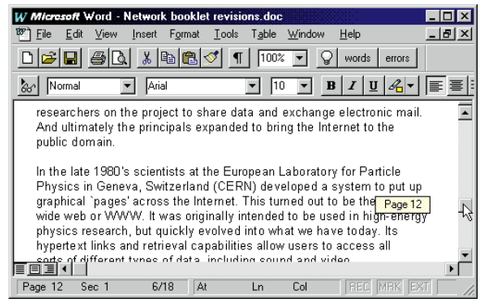
First, the bad news. Neither WordPerfect nor Word Pro would give you a live scroll in this situation either. To scroll live through any of these packages, you have to use the down arrow at the bottom of the scroll bar. This may be stylistically different to Netscape's scrolling method, but there are worse problems. Don't forget that if you click on the bit of the scroll bar underneath the slider, you descend one screen at a time.

All three packages have different ways of showing where you are in the document when you scroll by grabbing the slider. Word shows which page you are on using a little tag that pops up next to the slider. Word Pro goes one better by showing which section and page you are on in the little tag. Slapped wrists to the development team at WordPerfect — it lets you guess where you are in a document by the position of the slider! This is easy enough on a four-page document, but nigh-on impossible on a 40-pager.



Scrolling in each popular word processor package: Lotus Word Pro (left), Corel WordPerfect (below), and Microsoft Word (bottom)





The good news is that the scrolling is not live for a reason. Try it with a long document and you can jump backwards and forwards very quickly because you are not limited by the time it takes for the PC to scroll. In big documents this is extremely useful: scroll speed is the biggest processor-based limitation on a PC. If you're running Windows 95 on a 486, you'll know what I mean.

If you haven't discovered scrolling by picking up the scroll bar and dragging it, I suggest you give it a try. Look on the bright side.

TrueType signature

At present, if you want to send a signed fax (or email) you can't do it very well. You can scan your signature, yet expanding it immediately makes it look horrendous. There are, however, a few souls who will convert your signature to a TrueType font — install the font, drop in your signature and it will scale as necessary.

I've received an email from Victory Press, which will do this for $28.95 per signature. The company will email you the form to complete. But of course, you can't return the form via email because if you could return the form with your signature on it already, you wouldn't need the service, would you? But enough of this philosophy — see the "PCW Contacts" box (page 290) for how to get in touch with Victory Press.

Big document tip

You thought you'd got away with me lecturing you on long documents, but my alter ego, Storm Dunlop, has some good advice. He's worked with big documents: up to 400,000 words. That's almost a week's work, ho, ho.

"*May I sound a note of caution about long documents, such as whole books? Even with a very competent word-processor, such as Word, I would strongly recommend that these should be handled in sections that do not exceed 20,000-30,000 words,*" he advises.

According to Storm, there are several reasons for this:

1. Nearly every function, such as loading, scrolling, searching and auto-saving, is much faster with short documents.

2. Even with a large amount of memory, search-and-replace operations throughout an extremely large document are not only slow, but may crash. This is particularly the case if, for some reason, you need to (temporarily) remove the CR/LF characters at the ends of lines or paragraphs, or (even worse) if you have to carry out an operation on all the spaces in a document.

3. Because of the way in which editorial changes are implemented by the word processor, multiple search-and-replace operations may eventually exhaust the memory capacity, again causing a crash.

In short, you are far less likely to get

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Tim's macro club

Yes, yes, yes, I know. I had one of my occasional lapses a couple of months ago when printing a macro to cycle documents in WinWord. As about 400 of you were careful to remind me, this is done by Ctrl-F6, and there's an internal command called NextWindow to short-circuit the first macro. Of course, I knew all along and was only testing you. Ahem!…

To make the best of a bad situation, here are a few other points that came out of what they're already calling "The Great Control F6 Disaster of November 1996".

1. Shift-Ctrl-F6 will reverse the direction in which the documents cycle. Thanks to Jean Elliott of Upminster (among others) for that tip.

2. Timothy Morris, of Oxford, has a quickie macro for Word 2: "In Word 2, NextWindow is an internal command. You can simply assign it to CTRL+TAB, although it still requires a macro to assign it, and the syntax needs to be:

```
Sub MAIN
'set i to scan code for CTRL+TAB
i = 256 + 9
ToolsOptionsKeyboard .KeyCode = i, .Show = 0, .Name = "NextWindow", .Add
End Sub
```

"If you add

```
i=512+256+9
ToolsOptionsKeyboard .KeyCode = i, .Show = 0, .Name = "PrevWindow", .Add
```

then SHIFT+CTRL+TAB will cycle in reverse too."

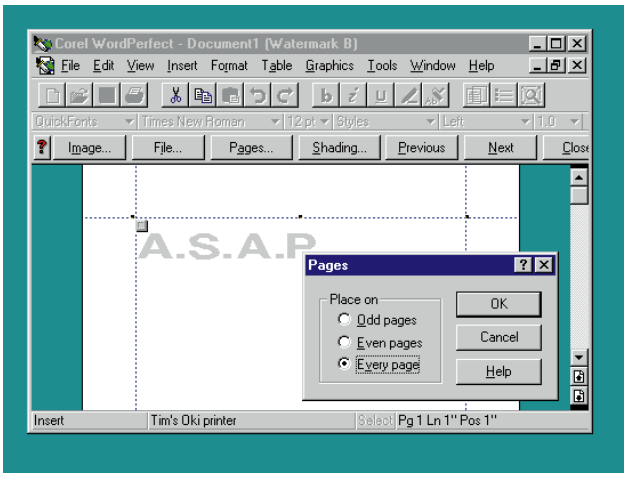
3. Well, that's the last we'll hear of that, I hope. Meanwhile, a rare bird — a WordStar macro. "I hope there are enough WSWin users out there to make it worth printing," says Nicholas Hill, via AOL. Well, Nicholas, I'm not sure there are. But what the heck, we're a magazine of reference and we must represent the views of a broad church.

This macro is that old chestnut, the transpose letters macro. The reason it's an old chestnut is that everyone makes these mistakes. "Select the first with the mouse, click the button and, hey presto! they swap places, which is why I have named the macro SWAP." Good name.

```
REM Description:
REM WSWin Macro File: C:\WSWIN\MACROS\SWAP.WMC
REM C.N. Hill  20 October 1996  [NicholasHl@aol.com]

EditCut
CharRight 1, 0,
EditPaste
```

Erm... that's it. Well, it's the first one I've had in a year, but if anyone has any, um, longer macros for WordStar, we'll print those too.



Watermarking in WordPerfect

corruption of a document or lock up the machine if you work with small files. If you need to paginate throughout the book (if you are producing camera-ready copy, for example) it is usually simplest to start the numbering of each section where the previous one left off."

I'd agree, apart from the pagination question, because when you edit any section, you have to manually go through and change the start page of all affected sections. I suppose it's better than a crash.

Watermarker wheezes

Here are two tips for watermarkers. The first is to buy WordPerfect, as Richard Bowden-Dan points out (via AOL).

"*The easiest way to put a watermark in WPWin 6.1 is to use the Watermark feature (lurking under the Format menu). Alternatively, there is even one of the dreaded Coaches for the purpose.*"

It is, he concedes, much trickier in WordPerfect for DOS!

Colin Hensley emails me, from his job with a prominent Japanese car manufacturer, to remind us that all this doesn't have to be done in software — printers can be handy, too.

"*Don't forget that many PostScript printers offer watermarking as a feature of the printer. For example, with the HP LaserJet 5PS, the configuration is in the Print Options panel,*" he adds.

Should Colin be sending such frivolous email on company time? Why not? If his bosses are reading this: give the man a raise. He's the sort of helpful person we should encourage.

Wily ways with Word

Here's corroboration on the file conversion bug issue, from Chris McCarthy in Birmingham, following the problems faced by Kim Cullen a couple of months ago.

"*It might be worth mentioning that the converter for Word 6 to Word 2 is not perfect. I regularly receive Word 6 documents at work but actually use Word 2. We have the converter on the network and so can theoretically open Word 6 files without a problem.*

"*On a number of occasions I have received Word 6 files, opened them, and found the document shorter than I expected. Under some (undefined) circumstances, the converter loses the end of the document; in my case, the last two-and-a-half pages out of a six- or seven-page document.*"

Chris' support department raised the issue with Microsoft which admits there's a problem and has made a fix available.

So if you regularly convert important documents from Word 6 to Word 2 (not uncommon), or if they are converted anywhere on your network, check they aren't getting chopped. If they are, get the fix from Microsoft tech support.

The alternative is to save everything in Word 2 format. The best way to do this is to add a macro to your toolbar, which pulls up the FileSaveAs command and prompts you to save somewhere else as a Word 2 document. You could even replace the save with SaveAs Word 2 format, but this will lose Word 6-specific features. For most of us, it's a small price to pay.

There are a few natty macro writers among us who, I'm certain, will be able to design a nice neat routine with a dialogue box, enabling you to save to a Word2-specific directory.

There are prizes of book or record tokens for clever routines.

Bug board

Has the world gone mad, or is it me? Tor Salomonsen contacts me with a dire warning: "*After a power breakdown, Word 7 will reconstruct the latest autosaved version of your document even if a manually saved version is more current,*" he writes.

Is this true? I haven't been able to replicate it, and there's nothing in Microsoft's knowledge base to confirm the bug. More reports, please.

Dear Santa…

It's been a hard year to be interested in word processing software, because everyone's doing the same thing: buying Word for Windows.

I really wanted some stiff competition for Word, from the industry, in 1996 and we've sort of got it. WordPerfect's new version matches Word in most respects and betters it in a few, but there's not much point, is there, when Word is being so closely tied to Microsoft's internet effort?

So, what I'd like for Christmas this year is a new type of word processor: one that will help people to write well. Not just in pretty typefaces, but one which will tell you whether what you are writing is any good, whether you should use "yours sincerely" or "yours faithfully", and have an opinion on whether you should have a comma or a semi-colon.

I'd also like something that takes bullet points and makes them into paragraphs, knows the right way to write the punchline to a joke, and suggests interesting and quirky adjectives to brighten up dull documents. I must read millions of words a year, and whether they are letters, white papers, press releases or magazine articles, technology makes sure that most are beautifully presented. They're just badly written.

I'd like a printer that fits the gap between my PC and the monitor, and a PC that scrolls documents to the right a bit, rather than three lines too low, then three lines too high, then three lines too low and so on.

Finally, I'd like a pen computer that can recognise my handwriting, although I think that's probably unrealistic. If you see one, it should be just the right size for my stocking.

PCW Contacts

You can contact **Tim Phillips** by post c/o *PCW* at the usual address, or email him at his CIS address

CompuServe 104047,2750
or **wong@cix.compulink.co.uk**

Victory Press, 1119 S. Mission Road, Fallbrook, CA 92028-3225, USA;
email **us043191@interramp.com**

Taking the **register**

Stephen Wells dips into the Registry to remove troublesome messages. Plus, adding background graphics to a worksheet, and problems with bins and cases.

These days, many Excel 7 add-ins have their own uninstall program. But when you start Excel after deleting an add-in, you may see a warning notice that such-and-such a file cannot be found.

If you right-click on the Start button and choose Explore, you'll find a program called Regedit.exe in the C:\Windows directory. If you can't find it, click the Name column and it will list the files in alphabetical order. Double-click Regedit to start it. Under the displayed MyComputer root directory you'll see several sub-directories starting with HKEY. You want HKEY_CURRENT_USER. Click on this to expand it, then successively expand Software; Microsoft; Excel; 7.0; Microsoft Excel. You are now six levels down from MyComputer. Go down to the sections with names starting with OPEN. If you double-click the first one it should read:

```
C:\MSOFFICE\EXCEL\LIBRARY\ANALYSIS
 \ATPVBAEN.XLA
```

Go down to the last OPEN item. It may be OPEN4 or OPEN5. Click that and you'll probably see an entry like:

```
/F C:\MSOFFICE\EXCEL\
 LIBRARY\Program.xla
```

The F switch simply tells Excel to add custom functions among the Insert, Functions menu items. An R switch would open the file as read only. If Program.xla is actually the name of the add-in you're trying to get rid of, just delete OPEN4 or OPEN5 entirely. Close Regedit. You won't have to restart Windows for the change to take effect. Just start Excel and the troublesome message will be removed.

This procedure is much like removing an entry to an .INI (initialisation) file. Applications, like Excel 7, which only run under Windows 95, don't use .INI files. Everything they need to know is stored in the Registry.

Obviously, Windows 95 can run 16-bit software, like Lotus 1-2-3 Release 5 for Windows. What happens is that when Windows 95 is booted, it examines the WIN.INI, SYSTEM.INI and any additional .INI files, like 123R5.INI, to see if any unique device drivers need to be loaded. Then it moves on and takes its orders from the Registry, which could be defined as a database of everything Windows needs to know.

Look under User and you'll probably see your name. Font sets the default font which might be Times New Roman 10 or Ariel 10. Pos shows the co-ordinates, top, left, width and height of the opening position of the Excel application window. If Basics reads 0, the tutorial runs when Excel is started. If it reads 1, then the tutorial does not run. It's set at 0 when Excel is installed and changes to 1 after the first use.

The Options section offers numbers in hexadecimal and decimal. Choose decimal and it probably reads 87. This is the sum of the following values: 1 to show scroll bars, 2 to show the formula bar, 4 to show the status bar, 16 to use A1-style cell references (rather than Row 1 Column 1), and 64 enables DDE (Dynamic Data Exchange).

But I only pass on these additional details because they're interesting: the average user is well-advised to stay out of the Registry. Generally speaking, it's best to make everyday changes by choosing options in an application, or using Control Panel, as Microsoft recommends.

By design

It's always my little asides which get me into trouble. In a recent column I wrote that you can dress up your displayed worksheets by choosing Format, Sheet Background and selecting a graphic file. I should have left it there, but I slipped in the parenthetical thought that you could print sheets with a background if you have a colour printer. Wrong.

I didn't try it until Peter King emailed that only his worksheet would print. No background. Belatedly, I found Article Q134212 of 28/8/96, entitled "Can't Print Background Graphic Included on Worksheet" in the Microsoft Knowledge Base. It states: "Although you can add a background graphic to a worksheet, this graphic will not be visible when you view your document in print preview or when you print it. The information in this article applies to Excel for Windows 95, version 7.0." And it goes on: "This behaviour is by design of Microsoft Excel, because printing a background is extremely slow on most standard printers."

Time to call on Michael Rickard, an Excel guru at a leading West Coast university who has bailed me out before. He came back with a workaround. His instructions were in shorthand, so I'll spell out the steps I took to make it work.

Let's say you want to print the range A1 to H16 in OLDFILE over Microsoft's familiar Clouds bitmap:

- First make the Camera tool visible. (It's probably on the Utility toolbar.)
- Open OLDFILE.
- Now open a new worksheet. Select the empty range, A1:H16.

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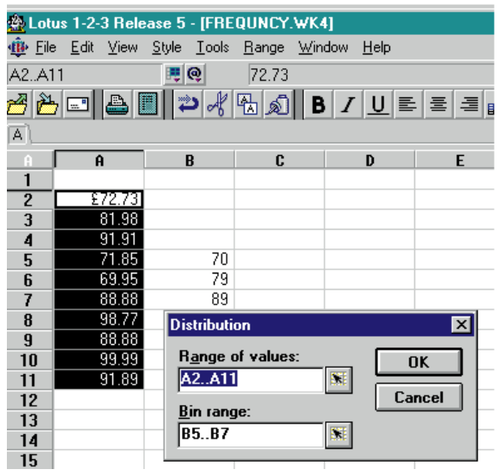
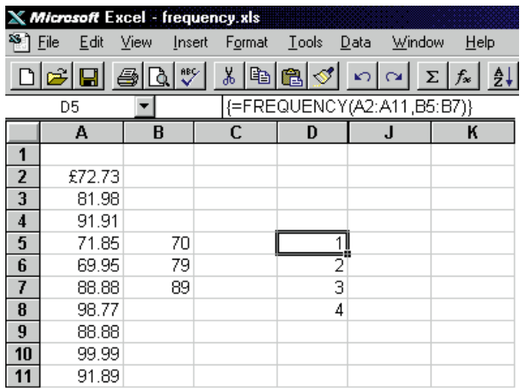


Fig 1 (left) **Dividing the distribution of a data array into bins is easy in Lotus 1-2-3, using menu items**

Fig 2 (below) **Excel has a FREQUENCY function for arranging distribution, which takes a bit of getting used to**



	A	B	C	D	J	K
1						
2	£72.73					
3	81.98					
4	91.91					
5	71.85	70		1		
6	69.95	79		2		
7	88.88	89		3		
8	98.77			4		
9	88.88					
10	99.99					
11	91.89					

● Now choose Tools, Options, View, No Gridlines. Then cell A1, Insert, Picture, Windows Directory, Clouds.bmp.
● Save this file as NEWFILE. (This is the equivalent of a background picture.)
● Choose Window menu, OLDFILE. Select A1:H16. Click the Camera tool.
● Choose Window, NEWFILE, cell A1. (This pastes a linked picture of your data on top of the clouds image.) Drag this object the last little bit into the top left corner of the sheet.
● Right click and choose Format Object on the shortcut menu, then select No Border, No Fill. Click OK.

That's it. You can now view the combined image under Print Preview and print out a hard copy. I must send Michael a long overdue book token.

Binning it

I've got so used to all this column's enquiries arriving by email that it was almost a shock to receive a nice, old-fashioned, typed letter from Alistair P Campbell of West Sussex: "*I think I have found a bug in Excel for Windows 95. When the Frequency function is selected to display the distribution of a data array, the only result is in the first bin. The remaining bins remain blank. I am using a new Dell Dimension XPS P166s and Dell agrees that there appears to be a bug. Your opinion would be welcome. I use frequency distributions a lot, and am having to revert to my older Lotus 1-2-3 spreadsheet to provide results for this function.*"

I've discussed before how some 1-2-3 functions differ from Excel. What we have here is a very easy-to-use menu item in 1-2-3 being replaced by a function in Excel, which takes a bit of getting used to.

Let's say that in the range A2 to A11 you have ten prices. They are in no particular order and there might be duplicates, but they are all below £100. The objective is to see how many prices fall in the ranges £0 to £70, and £70.01 to £79, £79.01 to £89, and £89.01 to £100.

In either 1-2-3 or Excel, you indicate these groups — or bins, as both spreadsheets call them — by simply entering 70, 79, and 89. For this example, we'll enter those numbers in B5 to B7.

In Lotus 1-2-3 Version 5, as shown in Fig 1, you don't have to select any particular cell. You just choose Range, Analyse, Distribution, and a dialogue box invites you to enter, or select with the mouse, the range of values (here, A2 to A11) and the bin range (here, B5 to B7). Then as soon as you click OK, 1-2-3 automatically puts the answers into the column next to the bin array — easy.

Excel's methodology would confuse anyone until they had become familiar with the full procedure. What you have to do, if you have four bins, is to select any four successive blank cells in any one column. I selected D5 to D8.

Click in the formula bar, then the fx (function) button. Select the Frequency function. This opens a similar dialogue box to the Lotus one.

Again you enter, or select with the mouse, the range of values (A2 to A11 again) and the bin range (B5 to B7). But when you click OK, you find yourself back in the formula bar at the end of the new formula.

Now you have to press Ctrl+Shift+Enter. Only then will you get the right answers, as shown in Fig 2. As this is an array, you don't enter the curly brackets which appear around the formula; you just press, all together, the three keys mentioned.

I sent a demo of this on a disk to Alistair. He graciously replied: "*Success! I'm beginning to appreciate Excel more and more. Thank you for your help.*" Good. Another satisfied reader!

On the case

John Young, of the UAE, asks: "*Could you advise if there is an easy way to change the characters in Excel from lower case to upper case on multiple cells, on a spreadsheet? The format menu for fonts does not have the case change as an option. I have found this problem in both Excel 4 and 5, and it can arise when different people have input data to a spreadsheet using a different case (upper or lower). To ensure uniform presentation, I find that it is necessary to adjust each cell and that there is no quick method.*"

John doesn't specify which version of Excel he is currently using, nor whether he wants to end up with all lower case or all capitals, so I'll discuss a couple of approaches.

One solution for versions 4, 5 or 7 is to use the LOWER, UPPER or PROPER functions. They don't reformat text but will redisplay it in another cell in lower case, capitals, or by capitalising the first letter of each word respectively. All three functions ignore characters which are not letters. An example is often the best way of clarifying usage:

If cell A5 holds the phrase *There are 2 Brown foxes*. In any cell, =LOWER(A5) would display, *there are 2 brown foxes*; =UPPER(A5) would display, *THERE ARE 2 BROWN FOXES*; and =PROPER(A5) would display, *There Are 2 Brown Foxes*.

The only way I know to change the actual text in place (that is, not repeat it in another cell) is to run a macro. But if you're going to do that, you may as well enter the text, initially in a dialogue box. Then it can be translated before it's used. To broaden the interest for other readers, let's say the text to be entered is a special password.

The regular way of protecting an Excel file with a password is via File, Save As, Options. But suppose you have prepared your own application and want to use a password to protect a part of it. If it's for internal company use, you could make it easier to remember the password by letting the staff member enter it in upper or lower case. You could even give them the first letter as a prompt.

As a gateway, the starting point could be to create a button, which can be done automatically from the Drawing toolbar. You can then assign a macro to it. In other words, the user clicks the button and the macro runs. If the macro is written in VBA, you can use two of its standard functions, Lcase and InputBox. See Fig 3 for the listing.

The password I've used is "mchenry", but because the user-defined GetTheWord function incorporates Lcase, it can be entered as McHenry, or MCHENRY, or any other case combination. The InputBox function takes a number of arguments, but here I've used the first three and let the defaults be used for the remainder. The prompt in the input box asks "What is your password?", and the title of the box is Password. The third argument here is, M. This means that when the box appears, the first letter (here, M as a capital) is displayed at the start of the password entry line.

If the user enters Matthew or MacHenry, or makes some other mistake, they receive the message "Sorry. Wrong Password". When the user clicks the OK button in this message box, the workbook is minimised in this macro to symbolise no entry.

If the correct password is entered, the user sees the greeting, "Welcome to this application", and can continue.

The button and the macro are in the Excel 7 file, Passes.xls, in the Hands On Spreadsheets section of our cover-mounted CD this month.

Fig 3 Assigning a macro

```
Sub Entering()
        Dim TheWord As String
    TheWord = GetTheWord
    If TheWord = "mchenry" Then
        MsgBox "Welcome to this application."
        Else MsgBox "Sorry. Wrong password."
        ActiveWindow.WindowState = xlMinimized
        End If
End Sub

Function GetTheWord()
    GetTheWord = LCase(InputBox("What is your
                 password?", "Password", "M"))
   End Function
```

Dear Santa...

Obviously you read *PCW* or you wouldn't see all these notes in the Hands On section, so look in the Spreadsheets section of our CD-ROM for pressie hints. Click on Excel 97 demo.exe and you'll see how the coming version of Excel can include hyperlinks to import data from web pages and send mail.

Yes, I'd like a beta copy of Office 97. It will have a new, improved Excel as well as updated versions of Word, Access and PowerPoint. It will also include the web authoring and management application, FrontPage (which I've raved about before), and Publisher, the easy-to-use DTP package. In Excel, the AutoCorrect feature (which irritates me but is beloved by many, I'm sure) will be even more intelligent: popping brackets in formulas if you forget them, for instance.

Microsoft's gone internet bonkers, so the latest Office will be supplemented by a wide range of animations, audio files, clip-art, fonts, help files and templates downloadable free from the MSOffice web site.

After a year, I've still never totally mastered Exchange and Schedule+, so I will welcome the new program, Outlook, which will replace both of them. Maybe the new Office Assistant animated wizards will make things clearer for me, too.

In the same section of our CD, have a look also at the files 123p1.pdf and 123p2.pdf, which run under Acrobat. These will remind you that I'm dying to see the new 32-bit Lotus 1-2-3 97. It, too, will feature shortcuts to the internet, as well as automated demonstrations of common tasks, enhanced printing facilities, new autototalling, and an easier way to create dialogue boxes.

The third present is not for me, but the people who write manufacturers' service contracts: a good pocket dictionary. My current PC came with a one-year free Next Business Day Repair Service Warranty, on-site at their discretion. Or, you could buy two- or three-year warranties. When the year was over, I wanted to pay for an annual renewal, but they've since dropped the one- and two-year options. I was told I could only buy a three-year warranty, which, amazingly, starts from date of purchase. So by purchasing that, I lost my first free year. They also have a Lifetime Return to Factory Warranty; but lifetime isn't defined in the way you or I would. And the right is retained to send parts and tell you, over the phone, how to replace them. They are entitled to offer any services they like, but I wish they wouldn't redefine simple words like "three", "lifetime" and "return".

On the *PCW* CD-ROM

The *Hands On Spreadsheets* section has a short animated file, Excel 97 demo.exe, which previews the availability of hyperlinks in the forthcoming Excel 97. The files 123p1.pdf and 123p2.pdf are Acrobat files which give some details of the anticipated 32-bit Lotus 1-2-3 97, designed to run under Windows 95 and Windows NT. The Excel 7 file, Passes.xls, has the macro shown on these pages as Fig 3 and a button for running it.

PCW Contacts

Stephen Wells welcomes comments on spreadsheets, and solutions to be shared, via *PCW* at the usual address or at **Stephen_Wells@msn.com.**
Files can be attached with MAPI-compliant software. The UUE program, XferPro, works. It can be downloaded from the CompuServe Internet Resource Forum.

The video **top ten**, again...

A recent query regarding video rentals has prompted some keen response from readers. Mark Whitehorn presents some of your solutions, plus some general tips and teasers.

In the October issue I published a couple of questions from readers. The first concerned a video rental company which wanted to find out the most popular videos rented out over a specific period, essentially the "Top Ten" videos for that period.

Several people sent in further suggestions, including the following from Roger Moran: *"By 'standard' SQL, I assume you are referring to the SQL/92 standard, and explicitly excluding all the various vendor-specific extensions such as the 'TOP' command in Microsoft Access SQL."*

No, but the misunderstanding is my fault for not being accurate in my choice of words. Eamonn Mulvihill's original request was for a solution which worked with Borland's Local-SQL which he said didn't support nested SELECT statements. I should have said something like "lowest-common denominator SQL" rather than "standard". Roger Moran continues: *"Since MS Access seems to be your first choice when describing problems in your column, I will use MS Access SQL syntax in the following, although the SQL is easily ported to any ANSI-compliant SQL/92 dialect.*

"We start with an aggregate query to provide us with a count of transactions per video within a given date range. This is trivial:

```
SELECT VideoNumber,
 Count(VideoNumber) AS VidCount
FROM Hist
GROUPBY VideoNumber
WHERE Trans_Date BETWEEN
 [StartDate] AND [EndDate];"
```

I know it will sound picky, but although the sentiment behind this is quite clear, I think the syntax for Access actually needs

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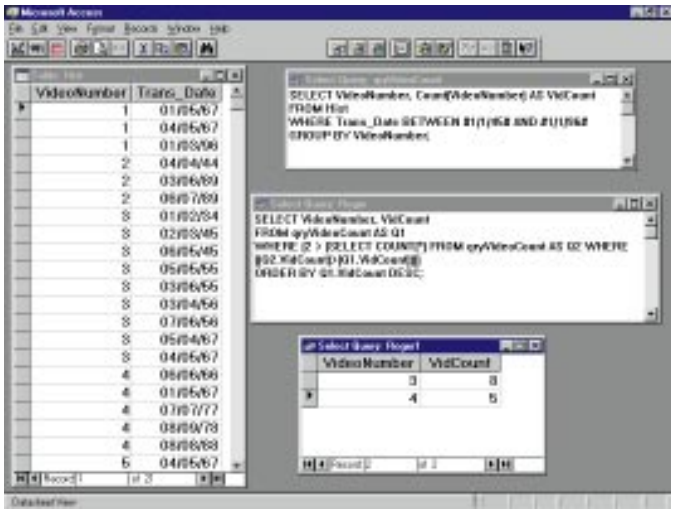


Here is Roger's solution. The only change I have made is to include the dates into the first SQL statement so that the query runs without putting up dialogue boxes

Dear Santa...

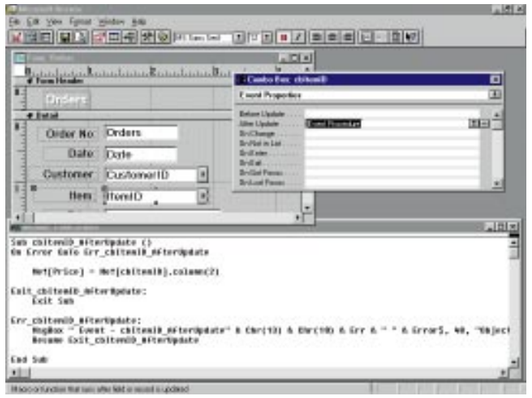
Last year, I asked you to make our current crop of RDBMSs a better match to the relational model, and also for more and better database design tools. I don't know about the rest of the kids, but frankly, I was just a little disappointed. None of the RDBMSs has shown a marked improvement, and the tools situation is still dire.

Sigh. Perhaps I'm asking too much. After all, the vendors don't seem to be interested in what I asked for either, so you must face an uphill struggle in trying to persuade them. This year, I'll try for really achievable requests, but first, a bit of background. Many database professionals are having their serious work disrupted by trivial requests from the management about putting data onto this "web" thing. Now, we all know that the web is just a passing fad. Just like CB radio, once the fuss has died down, I'm sure most people will go back to the telephone. But while it is fashionable, we have to look keen. So, what we need are sensible tools for handling data from databases on the web.

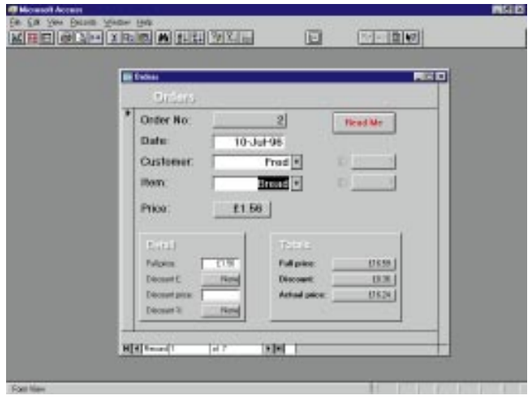
Borland has already made a good start with IntraBuilder, and Microsoft is following with the improved web-publishing abilities of the Office products, but there is still a huge way to go. Neither of the products addresses the problems of signalling between the browser and the database to allow proper transaction control. This is not to say that transaction control is impossible, just that it is currently all left to the programmer. There are other problems as well. With present technology, if the browser sends a query which returns, say, 140 records, those are usually buffered at the web server and sent to the browser in chunks of, say, ten. This is crazy! Every time the user wants to see another ten, there is a pause as the server is contacted and the next ten are sent. This problem isn't going to be solved by a single product; it needs to go right to the standards that these technologies use. If you could wangle your way onto the appropriate standards committee to address this one, we would all be eternally grateful.

By the way, I'd still really like a mouse mat with a penguin on it. I mentioned this last year, but it must have got lost in the sleigh. Perhaps you could check under the seats?

(right) Tony Wall's solution, showing the form and the code behind the combo boxes



(below) Geoff's form, which also totals the orders



to read as:

```
SELECT VideoNumber,
 Count(VideoNumber) AS VidCount
FROM Hist
WHERE Trans_Date BETWEEN StartDate
 AND EndDate
GROUP BY VideoNumber;
```

"In MS Access, we can use this query directly as the datasource for the second stage. In other products which do not support daisy-chaining queries in this fashion, it is a simple matter to convert the above query into an append query which populates a temporary working table, and then use that as the datasource instead.

"Let's assume we have saved the above query with the name [qryVideoCount]. The 'Top Ten' query will look as follows:

```
SELECT VideoNumber, VidCount
FROM qryVideoCount AS Q1
WHERE (10 > (SELECT COUNT(*) FROM
 qryVideoCount AS Q2 WHERE
((Q2.VidCount)>(Q1.VidCount))))
ORDER BY Q1.VidCount DESC;
```

"Here's a basic description of what's going on in the above query. For each record in qryVideoCount (Q1), we find the number of records in qryVideoCount (Q2) whose VidCount is greater than that of the 'current' record in Q1. If that number is less than ten, we know the 'current' record should be included in our 'Top Ten' list. We apply the test to each record in Q1 and the result will be the 10 desired records.

"The aforementioned query works, and is written in standard SQL, but it cannot be considered very efficient, since for each record in qryVideoCount (between 1 and 12,000 in Eamonn Mulvihill's situation), we must execute the sub-query which determines whether the record is to be included in the 'Top Ten' list. In a real world situation, it would probably be quicker to write some procedural code to pull out the ten records from qryVideoCount.

"Hope this information is useful."

Yes, it certainly is. It won't do as a solution for Eamonn's problem because of the nested SELECT, and I agree that it is likely to have speed problems on a large data set. However, Roger is quite right that his is a solution comfortably within SQL-92 and I have great admiration for its elegance!

You can clearly tweak the second SQL statement very easily to alter the number of records that it returns, simply by changing the numeric value in the line:

```
WHERE (10 > (SELECT COUNT(*) FROM
 qryVideoCount AS Q2 WHERE
```

I have changed it to two in the sample database (ROGER.MDB), because the HIST table has so little data in it.

Alistair Logie sent in this solution for FoxPro users faced with a similar problem: *"I read with interest your PCW Databases column about SQL selections of the top ten rented videos. One solution in FoxPro would be to use two SQL statements and a Cursor:*

```
SELECT  VideoNumber,
 COUNT(VideoNumber) AS VidCount ;
 FROM hist ;
 INTO CURSOR mytable ;
 GROUP BY VideoNumber ;
 ORDER BY VidCount DESC

SELECT  VideoNumber,  VidCount ;
 FROM mytable ;
 WHERE RECNO() < 11
```

"I don't know if this is usable on other databases. It does rely on being able to use the absolute record number, RECNO(), as a selection field. The attraction of using a Cursor as a temporary file is that FoxPro creates and erases it itself."

The second question in the October issue covered a more general problem. Suppose you have a set of Customers and Items for sale. Given that each item has a specific, unique price, it is clear that the price fits into the ITEMS table. If each Customer has a unique price for each item, it is equally clear that the price needs to go into a separate table which lists each customer, item and the unique price for that key value.

What if the situation is somewhere in between, where most prices are standard but there are some exceptions? I produced a solution, but asked for suggestions, improvements or comments. The first comes from Tony Wall, and his database is on the CD as TONYWALL.MDB.

"I have enclosed an alternative solution to the Customer & Prices problem from the October issue. Whether it will work efficiently with the 400 customers and 300+ products is another matter.

"In the first instance I took your Default List and Exception List and used these to create a union query as follows:

```
 SELECT *
 FROM [PriceList] as PL
 WHERE NOT EXISTS
 (SELECT *
 FROM [ExceptionList] AS EL
 WHERE PL.[CustomerID] =
EL.[CustomerID] and  PL.[ItemID]
=EL.[ItemID]);
 UNION SELECT *
 FROM [ExceptionList];
```

"This is used as the basis for the combo box data source on the orders form for retrieving the correct price."

Tony then sent another mail message, saying that the performance was terrible with a larger data set. His suggested improvement is well worth looking at, and is in TONY2.MDB. Geoff Wyss sent in another; see GEOFWYSS.MDB.

"In the October 96 issue of PCW, you posed a problem about merging prices from two sources to make up an Order from a default price list and an exceptions list. The attached database file shows two possible solutions which might be of interest, one using a Union query, the other using an IIF statement. Click on form Orders2. There is a ReadMe button on the form which gives an explanation."

For this month's problem, I have held off producing a solution myself. This is mainly due to cowardice, since this problem brings us once again into the holy wars of "strict relational" vs. expediency. I tend towards a purist view, but in this case I can see reasons for a more heretical solution. Before committing myself to be burned at the stake, what do you think? Let's try not to get too wound up about this one. It is Christmas, after all.

"I am a teacher, and recently used Microsoft Access 2.0 to produce a database for recording and reporting on pupils' performance in tests. To keep the database as flexible as possible in use, I store test results in a single table with four fields: each record in the Scores table includes an identifier for the pupil, an identifier for the test, the percentage score achieved by the pupil in the test, and the position of the pupil out of his/her teaching group. Records are added to the table as data are entered by the class teacher. (The pupil and test identifiers together make up the primary key, as each pupil appears in the table many times, as does each test, but each pupil can only take a given test once.)

"It is useful to have the computer calculate the position of the pupil automatically, once the data for a full teaching group has been entered, but I have not found a function in Access to do this easily. The pupils' teaching groups are recorded in a separate table. It is straightforward to produce a query listing for a particular test, the pupils in one teaching group and their percentage scores, and this query can be sorted appropriately. But then to work out the position of the pupils within the group and store this in the appropriate field, I have resorted to a complex sequence of operations involving creating and deleting temporary tables.

"Using this method to calculate pupils' positions slows down the program significantly and, because of the use of temporary tables, has led to problems when two teachers using the network attempt to enter test scores at the same time. Is there a direct way to fill in the 'position' field in the Scores table? I have tried different techniques, but have not found a wholly satisfactory solution." Andy

Andy's test database (not containing real data about real children) is on the CD as ANDY.MDB.

Teasers

A couple of teasers from Jeff Jenkins:

1. Strange database design

A database I was working on stored amounts as positive numbers and had a separate field to indicate the sign of the number. This field had values of one or two to indicate positive or negative (don't ask why, I didn't design the database). The problem was how to extract the amounts as signed numbers. The solution I came up with was a mathematical one, selecting "amount*(3-(sign*2))". This works as "(3-(sign*2))" evaluates to 1 or -1. A bit of a rigmarole just to get a signed number out.

2. Summing only the positives

I needed to provide a total of all the positive numbers in a particular field in the database (e.g. all the accounts with a credit balance). I couldn't find an sql command to do this, so I resorted to another mathematical solution: "`SUM((amount+ABS(amount))/2)`"

Adding the absolute (unsigned) value of a number to itself comes out to zero for negative numbers, and dividing by two negates the effect of adding a number to itself, so the sum works. You can also sum up all the negative numbers with:

"`SUM(amount-(ABS(amount))/2)`"

Incidentally, the first one also works as

"`SUM((ABS(amount)+amount)/2)`"

but the negative version

"`SUM((ABS(amount)-amount)/2)`"

gives a positive total of all the negative numbers.

PCW Contacts

Mark Whitehorn welcomes readers' correspondence and ideas for the Databases column. He's on **m.whitehorn@dundee.ac.uk**

Festive fractions

Mike Mudge gets stuck into a feast of fractions for Christmas, and appeals for help on behalf of readers.

This month, I have a number of appeals to make:

1. Nigel Backhouse of the Division of Applied Mathematics at the University of Liverpool wonders if any readers would be interested in joining the Great Internet Mersenne Prime Search? He tells me that George Woltman is asking for volunteers with Pentiums and 486s and access to the web, to join a team searching for new, large Mersenne Primes. He provides free software and full instructions on how to use it. This can be downloaded from our world.compuserve.com/home pages/just for fun/prime.htm.

2. Alan Cox has been studying the paper by Artur Ekert and Richard Jozsa in *Reviews of Modern Physics*, July '96, pp1-28, entitled "Quantum Computation and Shor's Facturing Algorithm". In common with your columnist, he finds it difficult to understand but realises the importance of the subject area. Is anyone willing to produce a simple guide to the concepts involved? *PCW* may consider such material for publication, as it would be to the benefit of many readers and relate to the very frontiers of computational theory.

3. Caryl Takvorian is anxious to access a paper on the subject of NP-complete and intractable problems. Is any reader able to supply a suitable reference or offer such a paper to *PCW* and/or Caryl directly?

FRACTRAN: a simple universal programming language for arithmetic

Fractran: Due to JH Conway, Open Problems Commun. Comput, pp4-26, published in 1986.

To play the Fraction Game corresponding to a given list: $f_1,f_2,\ldots,f_k$ of fractions and a starting integer N, we repeatedly multiply the integer which is defined at any stage (initially N) by the earliest f_i in the list for which the answer remains an integer. Whenever there is no such f_i the game stops.

Formally: the sequence (N_n) is defined by $N_O = N$ (given) while $N_{n+1} = f_iN_n$ where i between 1 & k inclusive is the least i for which f_iN_n is integral, providing such an i exists.

Experiment 1 Consider the list of fractions $^{17}/_{91}$ $^{78}/_{85}$ $^{19}/_{51}$ $^{23}/_{38}$ $^{29}/_{33}$ $^{77}/_{29}$ $^{95}/_{23}$ $^{77}/_{19}$ $^{1}/_{17}$ $^{11}/_{13}$ $^{13}/_{11}$ $^{15}/_{2}$ $^{1}/_{7}$ $^{55}/_{1}$: these define PRIMEGAME (after Conway). Choosing N = 2, the other powers of 2 which are generated are those whose indices are the Prime Numbers in ascending order.

Experiment 2 Consider the list of fractions $^{365}/_{46}$ $^{29}/_{161}$ $^{79}/_{575}$ $^{679}/_{451}$ $^{3159}/_{413}$ $^{83}/_{407}$ $^{473}/_{371}$ $^{638}/_{355}$ $^{434}/_{335}$ $^{89}/_{235}$ $^{17}/_{209}$ $^{79}/_{122}$ $^{31}/_{183}$ $^{41}/_{115}$ $^{517}/_{89}$ $^{111}/_{83}$ $^{305}/_{79}$ $^{23}/_{73}$ $^{73}/_{71}$ $^{61}/_{67}$ $^{37}/_{61}$ $^{19}/_{59}$ $^{89}/_{57}$ $^{41}/_{53}$ $^{833}/_{47}$ $^{53}/_{43}$ $^{86}/_{41}$ $^{13}/_{38}$ $^{23}/_{37}$ $^{67}/_{31}$ $^{71}/_{29}$ $^{83}/_{19}$ $^{475}/_{17}$ $^{59}/_{13}$ $^{41}/_{291}$ $^{1}/_{7}$ $^{1}/_{11}$ $^{1}/_{1024}$ $^{1}/_{97}$ $^{89}/_{1}$: these define PIGAME (after Conway). Choosing N as 2^n the next power of 2 to appear is $2^{p(n)}$ where p(n) is the n^{th} digit after the point in the decimal expansion of PI.

Experiment 3 Consider the list of fractions $^{583}/_{559}$ $^{629}/_{551}$ $^{437}/_{527}$ $^{82}/_{517}$ $^{615}/_{329}$ $^{371}/_{129}$ $^{1}/_{115}$ $^{53}/_{86}$ $^{43}/_{53}$ $^{23}/_{47}$ $^{341}/_{46}$ $^{41}/_{43}$ $^{47}/_{41}$ $^{29}/_{37}$ $^{37}/_{31}$ $^{299}/_{29}$ $^{47}/_{23}$ $^{161}/_{15}$ $^{527}/_{19}$ $^{159}/_{7}$ $^{1}/_{17}$ $^{1}/_{13}$ $^{1}/_{3}$: these define POLYGAME (after Conway). Define $f_c(n)$ +m if, when Polygame is started at $c2^n$, then it stops at 2^m, otherwise leave $f_c(n)$ undefined. Then every computable function appears among f_0, f_1, f_2… The number c is called the Catalogue Number and is "easily computed for some quite interesting functions". Conway gives f_c for any c whose largest odd divisor is less than 2^{10}.

Problem

Understand and implement FRACTRAN in the form of the first two experiments. Follow this with an initial investigation of Experiment 3… and comment upon this approach to computable functions.

■ Send any implementation of the above algorithms to Mike Mudge, by 1st April, 1997. All material received will be judged using suitable subjective criteria and a prize will be awarded for the best entry (SAE for return of entries, please).

■ Responses to the three appeals should also be sent to Mike Mudge (for forwarding). George Woltman can be contacted directly as indicated above.

Report on Numbers Count May '96

Nigel Hodges examined "Problem MM" and used x = m/n, y = a/b (in their lowest terms) to distinguish two cases p does/does not divide m: obtaining solutions for p = 5 involving integers of 15 & 16 digits for m&n and 22, 23, 24 digits for a and b. Note that A. Bremner and J. Cassels, *Mathematics of Computation*, vol. 42, no.165, Jan 1984, pp 257-264, cite "*a most startling generator of all solutions for p = 877 where 42 & 40 digit integers arise as m & n whilst a & b have 63 & 60 digits respectively*". However, the prizewinner this month is Patrick Moss, of 26 Hillside, Grays RM17 5SX. His submission, "Rational Points on a Cubic Curve", includes an arithmetic/algebraic section followed by a section dealing with geometrical arguments, and finally, a set of special cases and generalisations. The computational aspects were programmed in C++ on a Gateway 2000 P5-120, prompting Patrick to ask if any reader has access to some decent code or knows of a not-too-expensive piece of software for handling large integer-length arithmetic? He used Microsoft Excel to draw the graphs but wonders whether other software could have done the job?

Details of this work on request to Patrick. A number of his results were subsequently confirmed in *The Arithmetic of Elliptic Curves* by JH Silvermann.

•PCW Contacts

Contributions welcome: Mike Mudge welcomes correspondence from readers on any subject within the areas of number theory and computational mathematics, together with suggested subject areas and/or specific problems for future *Numbers Count* articles. Write to him at **22 Gors Fach, Pwll-Trap, St Clears SA33 4AQ, or phone 01994 231121**.

Drive time

Floppy disks have been overtaken and lapped by today's removable storage drives.
Roger Gann explains the new technologies and sorts the hatchbacks from the sportsters.

It's all to do with relativity, you know. Ten years ago, when your PC had a 20Mb hard disk, a 1.2Mb floppy was a capacious device capable of backing up the entire drive with a mere 17 disks. Today, the standard hard disk fitted to PCs has become the 1.2Gb drive: a 600-fold increase in capacity. And what of the humble floppy? In the same period, its capacity has increased by less than 20 percent. As a result, it's now at a disadvantage when used in conjunction with any modern large hard disks — for most users, the standard floppy disk just isn't big enough anymore.

In the past, this problem only affected a tiny proportion of users, and for those that did require high-capacity removable disks (typically DTP'ers running Macs), solutions were available: 44Mb 5.25in SyQuest removable hard disks. But these were expensive.

Times have changed, and today, everybody needs high-capacity removable storage. These days, applications don't come on single floppies. They come on CD-ROMs. Thanks to Windows and the impact of multimedia, file sizes have gone through the ceiling. Create a Word document with a few embedded graphics and before you know it, you've got a multi-megabyte data file, quite incapable of being shoehorned into a floppy disk.

Awkward as it is, there's no getting away from the fact that a PC just has to have some sort of removable, writable storage, with a capacity in tune with current storage requirements. We all need removable storage for several reasons: to transport files between PCs, to back up personal data, and to act as an overspill for your hard disk, to give you (in theory) unlimited storage. It's much easier to swap removable disks than fit another hard disk to obtain extra storage capacity.

In 1981, 5.25in floppies kicked off at 160Kb, quickly went to 180Kb and then to 360Kb with the advent of double-sided drives. In 1984, the 5.25in floppy maxed-out at 1.2Mb. That same year, Apricot and HP launched PCs with the revolutionary Sony 3.5in 720Kb disk drive. Three years down the road, this doubled in size to 1.44Mb and for the past decade or so, that's where it's stayed. Oh sure, there have been attempts to increase the capacity of the humble floppy, but none got very far.

First, there was IBM's bid (in 1991) to foist a 2.88Mb floppy standard on the PC world, using expensive barium-ferrite disks, but it never caught on. And both Iomega and 3M had another go in 1993 with the 21Mb "Floptical" disk. But it never took off: it was just too dear and too small.

For a long time, the range of removable storage options wasn't extensive. You could choose between low-capacity floppies, clumsy tape solutions, expensive optical drives, and removable cartridges. But today, the situation is radically different, and finally there is a real choice in removable storage. There is a wide range of capacities on offer, starting around100Mb and rising to 1Gb. The new removable drives have never been more affordable, and having been designed with the end-user in mind, are easy to install.

Installation options

Removable drives are available both in external and internal versions. The former will have either a parallel port or SCSI interface, while the latter will have a SCSI or IDE interface, although IDE is not all that common at the moment.

Unlike fitting a second hard disk, which can be a daunting task, the great news is that most of the new breed of removable storage devices have been designed with ease-of-installation in mind. The easiest to install are the external drives with a parallel port interface. Not only do you not have to take the lid off your PC, but it also lets you share/move the drive between different PCs. You can use it with a notebook, too. And because it uses your printer/parallel port, installation is no more complicated than plugging in a cable.

The only problem with this otherwise perfect arrangement is that the parallel port, which was never designed to handle these devices, isn't very "fast", and older parallel ports can act as a bottleneck, slowing down the drive's data transfer rate. Luckily, however, most recent PCs are equipped with an enhanced parallel port (EPP or ECP) and these are capable of good data transfer rates. I recently used a parallel port tape streamer hooked up to an EPP port and it was capable of backing up at just under 8Mb/min — a pretty respectable rate. In any event, such bottlenecks would only really impinge on fast devices, such as removable hard disks. Slower devices, such as the Zip drive, don't have a stellar data transfer rate to start with and so are unlikely to suffer at the hands of the parallel port interface.

If the ultimate data transfer rate is what you're after, you ought to consider SCSI versions of these devices. Most internal drives (Jaz, SyQuest, MaxIT and Zip) tend to use a SCSI interface, which is fine if you already have a SCSI card fitted as installation is no more complicated than plugging a spare connector on the SCSI ribbon cable into the back of the drive. The same applies to external SCSI drives, too. Very often they can be "daisy-chained" to other external SCSI devices. If you haven't got a SCSI card, they can be expensive to buy and fiddly to configure, although Iomega does a cut-down SCSI host adaptor called the Jet, which sells for around £80. Given the choice, I'd spend another £20 and buy a better host adaptor, from, say, Adaptec, Bus Logic or AvanSys.

Left **Iomega's Jaz drive can take cartridges as big as 1Gb — enough space for you to back up your entire hard disk**

Below **SyQuest's EZflyer is cheaper but holds a maximum of 230Mb**

Spoilt for choice

Although all these devices offer the same basic facilities and differ only in terms of capacity and speed, they do employ different technologies. They can be split into categories based on their respective technologies. At the last count there were three removable storage technologies: super-floppy, hard disk, and magneto-optical. Even though CD-R discs are dropping in price and the Panasonic innovative PD hybrid drive offers some interesting advantages, neither technology currently has much market presence.

Super-floppies

The current crop of super-floppies may resemble conventional floppy disks in physical size and operation, but they don't use the same magnetic recording technology employed on the standard 1.44Mb floppy. Without doubt, the most popular super-floppy is the Zip drive, of which Iomega claims to have sold ten million. The secret of the Zip's good performance (apart from its high 3,000 rpm spin rate) is a technology pioneered by Iomega (based on the Bernoulli aerodynamic principle) which actually sucks the flexible disk up towards the read/write head rather than vice-versa. The disks are soft and flexible like floppy disks, which makes them cheap to make and less susceptible to shock. They're fast, and have a capacity of 94Mb — big enough for most users. Sadly, Zip drives are not backward compatible with 3.5in floppies and can't be used as boot devices, although there are BIOSs in the pipeline which will permit that. Imagine, you could install Win95 from a single floppy!

The new kid on the super-floppy block is the rival standard being promoted by 3M and Compaq. An LS-120 disk looks very similar to a common-or-garden 1.44Mb 3.5in disk, but uses a refinement of the old 21Mb floptical technology to deliver much greater capacity and speed. In fact, this technology had originally been developed by Iomega, but

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was abandoned and sold on to 3M. Named after the "laser servo" technology it employs, an LS-120 disk has optical reference tracks on its surface that are both written and read by a laser system. These "servo" tracks are much narrower and can be laid closer together on the disk: an LS-120 disk has a track density of 2,490tpi (tracks per inch) compared with 135tpi on a standard 1.44Mb floppy. As a result, the LS-120 can hold 120Mb of data.

As well as being a bit bigger, its other advantage over the Zip drive is that it can also read/write ordinary 3.5in floppies and so can be used as a boot device. While its data transfer rate is faster than that of a standard 3.5in floppy drive, it's not as fast as a Zip drive due to its considerably slower spin speed. And at present, the LS-120 isn't available to buy as an add-on — it's currently only available ready-installed on Compaq's new range of Deskpro PCs.

Hard disks

Above about 100Mb, the most commonly used removable drive technology is derived from that found in conventional hard disks, which not only gives you high capacities but also provides fast performance, pretty close to that of conventional fixed hard disks. These drives behave just like small, fast hard disks.

This approach isn't particularly new: SyQuest cartridges have been using the technology for many years. However, SyQuest drives have tended to be small

The PowerMO 230 is one of the latest generation of magneto-optical drives from Olympus

(44Mb and 88Mb). Recently, SyQuest embraced the 3.5in form factor and launched a 135Mb drive (the EZ-135) but this has been rapidly superseded by the 230Mb EZflyer. It's fast, like a hard disk, and reasonably priced (about £200).

Xyratex, the IBM spin-off, has got in on the act with its 540Mb MaxIT drive. This is a little pricier (about £300) but has twice the capacity and can read older SyQuest cartridges. It's nippy, too.

The drive with the largest capacity is Iomega's Jaz which can take cartridges as large as 1Gb. This, too, is affordably priced (about £375) and offers excellent capacity with great performance. Its huge capacity makes it possible to back up your original hard disk in one go, in just a matter of minutes. It's a good choice for audio-visual work, capable of holding an entire MPEG movie in one swallow. You could even make it your primary drive!

Magneto-optical

As you might expect from the name, these drives use a hybrid of magnetic and optical technologies. The disks have a special alloy layer that can be modified under the influence of a magnetic field. Changes can then be read by reflecting a laser beam off the alloy layer. The magnetic field in the magneto-optical (MO) disk actually twists the laser's beam of light, and this twist can be detected and used to read the data.

However, this is a "two-pass" process, and as a result, MO operations are relatively slow. This drawback is compounded by the fact that MO heads tend to be heavy, which also makes for slow average access times. Nevertheless, MO disks are cheap at around a tenner and they have top archival properties, often being rated with an average life of 30 years — far longer than any magnetic media.

MO came close to being killed off by the Zip, but a new generation of faster, cheaper drives, spearheaded by Fujitsu, have breathed new life into the format. MO disks are much the same size as 3.5in floppies but about twice as thick. Olympus has been the first to market the latest generation of MO kit with the slick-looking PowerMO 230. And Fujitsu has recently announced a 640Mb MO drive, the £299 DynaMO, which is backwards-compatible with older 128Mb and 230Mb MO disks.

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Direct action

Benjamin Woolley assesses Direct3D, Microsoft's promising API for adding 3D functions to applications. He also finds himself in the thrall of power mania: which hardware is big enough?

The internet is not the only area of the information revolution that Microsoft once neglected and is now determined to dominate. 3D graphics are also now firmly in the company's laser-guided sights. Its strategy has been to buy up existing technologies and Microsoften them up for global exploitation. One of these is Reality Lab, a set of programming tools originally developed by the British company, RenderMorphics, for rendering simple textured shapes in real time. Microsoft has renamed it Direct3D and developed it as the 3D component of its burgeoning multimedia application programming interface, DirectX, version 3 of which had just been launched at the time of writing this. The DirectX "evangelists" (a troop of which are bound for Europe, I am told) are promising that their technology will enable PCs to equal the current performance of consoles and arcades once hardware developments like Intel's MMX and Microsoft's own Talisman (see the November column) are commonly available.

Direct3D is an API, which means it acts as a sort of programming language (used in combination with an existing one, such as C++) for adding 3D functions to applications. Those applications may be games, they may be programs for authoring games and other 3D content, they may be molecular modelling packages, even databases or spreadsheets.

Microsoft has put a lot of work into Direct3D, and the demonstrations I have seen on the developer CD-ROM are promising. A simple textured sphere or teapot (the standard artefact for graphics demos), for example, will render smoothly in real time in a 320x240 window on a standard

An image entitled "Screw the Mold" by Sandford Bemi Faisonat, which features in the Apple QuickDraw 3D Gallery *(quickdraw3d.apple.com)*. The image was rendered using QuickDraw 3D, although obviously not in real time

Pentium system. Direct3D (and, indeed, DirectX as a whole) also has the important feature of being able to take advantage of whatever hardware resources are available. If it finds a 3D graphics accelerator, it will be used, so long as there is a driver, which is likely, as most of the major 3D graphics chips are designed to support Direct3D. But equally important, if no acceleration is available, Direct3D objects, and any sounds or 2D images with which they are combined, will still be displayed, generated by a "Hardware Emulation Layer" that reproduces in software any functions that are unavailable in hardware.

Direct3D is not the only 3D API on the market. There is OpenGL too, which is aimed at the higher-end market and is already well-established. More significantly from a PC point of view, there is QuickDraw 3D from Microsoft's old rival, Apple. In at least one head-to-head comparison (published in the American magazine, *Byte*) QuickDraw 3D came out ahead of Direct3D for offering a greater range of object primitives and for its support of both the Mac and Windows platforms. Some of the Microsoft literature claims that DirectX, too, will be cross-platform. There are some doubts about this. According to at least one source within the company, the main purpose of the technology is to give 32-bit Windows operating environments a competitive edge over rivals, which obviously include Macintosh.

So which API will prevail, and does it matter? It certainly matters, because either Direct3D or QuickDraw 3D are likely to provide the basis for 3D becoming a standard part of the PC environment, as commonplace as sound and 2D graphics are now. You will need to consider this when choosing both software tools and hardware, trying wherever possible to keep your options open by getting support for both (which most third-party developers are, so far, promising to provide).

The question as to which API is likely to prevail is a trickier proposition. We all know who has the marketing muscle. We all know who controls the operating system (or at least, the one used by the vast majority). But 3D is a relatively new field in PC terms, QuickDraw is already well supported, and you only have to visit Apple's QuickDraw server (quickdraw3d.apple.com) to see that the company means business.

Infobyte

An Italian company called Infobyte specialises in creating VR tours of historical sites that are truly spectacular. They include the stunning Giotto frescoes in the Basilica of St Francis in Assisi (pictured here), St Peter's Basilica, the Coliseum and, most recently, the restored tomb of the Egyptian queen Nefertari, a VRML version of which can be explored by pointing your browser (running on an extremely powerful workstation) at the company's excellent web site, www.infobyte.it. Once this sort of thing runs in real time on an ordinary PC over a standard internet link, I think 3D's day will truly have arrived.

Power mad

Last month, my Compaq Deskpro's hard disk drive decided to experience a strange, slow-motion crash, deteriorating from full working order to complete cabbage-like coma in the space of an hour. I packed it off to my supplier, where it gathered dust for three weeks awaiting Compaq's delivery of a replacement.

During its absence I had to resort to my backup system, an old 486 Viglen Genie, which, unlike the Compaq, has chuntered away reliably in the background without a squeak of protest since I bought it some time in the last century. Being modestly specified in all departments except RAM (it has 16Mb), the Viglen, I thought, would prove to be unusable. In fact, I found it capable of doing just about the same amount of work. For 3D, I returned to Autodesk's 3D Studio running under DOS; for writing, Microsoft Word running under Windows 3.11; for the internet, good old Pegasus and WinFTP (I decided to forgo the delights of the web for a while). It was not tidy, it was not integrated, but it did work.

Those of us who are working with 3D graphics are currently in the thrall of power mania. We are constantly told that more means more: more processing power, more RAM, and yet more sophisticated software means more creativity, more spectacular effects and yet more moolah.

Dear Santa...

In its opening months, 1996 seemed it might turn out to be the moment when 3D finally fulfilled its promise. Creative Labs was selling the 3DBlaster board, VRML was becoming better known. However, the 3DBlaster did not turn out to be the graphics equivalent of the SoundBlaster because only individual programs (games) could take advantage of it. VRML, too, was a bit of a damp squib; few had the hardware to do anything with it, fewer the desire to spend their online hours wandering terrains that look like they were designed by the Early Learning Centre.

Now, as the New Year arrives, one gets the distinct impression that things are starting to move. With the Millennium board and now the Mystique, Matrox has started to establish 3D acceleration as a standard part of the PC graphics subsystem. With the plummeting price of memory, systems are coming equipped with the 16Mb of RAM that is the absolute minimum for handling textured 3D data. With the emergence of mainstream APIs (see main story), we at last have a mechanism for bringing the benefits of the third dimension not just to games, but to a whole welter of applications.

But I do not expect 1997 to be year zero: we have some way to go yet. Santa keeps forgetting to pack his sleigh with such essentials as modular, easy-to-use 3D authoring tools (the current crop are overweight and monolithic), a standard for plug-ins, and the imagination booster all of us involved in the graphics business need if we are to start to come up with content that is both wonderful and practical .

For me, what 1996 lacked most was a Myst, some game or virtual artefact that aroused one's excitement in the possibilities of 3D. So, Santa, please could you give us another of those in 1997? Not Myst 2, but something that demonstrates what wonderful, colourful, inspirational landscapes that even a humble PC can help create.

So when I sat down in front of what to many must still represent the pinnacle of desktop computing power, a Silicon Graphics workstation, it was in a mood of extreme scepticism. The machine in question was SGI's new "personal" workstation, the O2*. SGI's definition of personal is somewhat different to, say, Viglen's. The cheapest O2 costs just over £5,000, for which you get a 32Mb system armed with a MIPS R5000 RISC processor running at 180MHz. It offers blistering graphics performance through a "unified memory architecture" (i.e. no special-texture RAM) combined with built-in hardware acceleration and a system bus that can shove data around at a rate of 2.1 gigabytes per second.

I spent about an hour on the O2, and found it (temporarily at least) restored my confidence in technology. It was the first time I had used VRML that was both nice to look at and explore, smoother than anything I have so far experienced on an NT box or, for that matter, a Unix one. That, of course, was partly because it used the latest version of SGI's Webspace VRML 2.0 browser. But it also seemed to indicate that SGI might still retain the edge when it comes to optimising hardware for graphics.

However, do 3D artists have to start contemplating spending more than £5,000 in order to do decent work? Do we really need all that extra power? And if we do, should we pay the premium that is inevitable if you leave the general-purpose PC architecture behind and choose something from SGI? Or should we start thinking about going back to basics: stepping off the technology roller coaster, settling back with the old products that we know and like, and leaving it at that?

For me, for the moment, not even the allure of an O2 can completely discredit the latter strategy. But then, my Deskpro is now back and apparently working well, I have started to use the Workstation edition of Windows NT 4.0, and I have been eyeing a rather nice accelerator board. It can only be a matter of time before power madness once again prevails.

** See PCW December 96 for a full review of the Silicon Graphics O2.*

PCW Contacts

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Yule be lucky...

Last year, Gordon Laing made his Christmas wishes known. Some came true, some didn't. Here, he reviews the year gone by and, ever hopeful, makes up his present list for 1997.

Ho ho ho! It's Christmas time again in the festive land of graphics and DTP. It's funny that the world seems divided into those who love Christmas but hate New Year, or vice-versa. I definitely fall into the former category, lapping up all that is symbolic in the materialistic Western interpretation.

A couple of years ago, when I was editing this Hands On section, I thought it would be a laugh to have a Christmas wish and rant session every year. Fortunately, for me anyway, Hands On's current captain, Eleanor Turton-Hill, has decided to continue with this tradition. So here goes.

Quark and Adobe

It's been an eventful and quite satisfying year in the world of graphics and desktop publishing. This time last year, Windows 95 was still a fresh and unknown beast, with little native software. Today, we are of course flooded with Windows 95- and NT4-ready products. Sadly, 1996 has not seen an upgrade of two major applications, Quark XPress and Adobe Illustrator, so my joint number-one rant starts here.

XPress 4 is supposedly on its way yet Quark doesn't seem to be in any hurry. After upgrading to Windows 95, I had to download several updates to get XPress 3.3 working correctly on my system; I'm currently on XPress 3.32 revision 3 but printing is not always 100 percent reliable. Interestingly, Quark dropped development of its fabled image editing package, XPosure, but is poised to release Immedia, its internet and multimedia authoring tool. However, the PC Immedia won't be released until well into 1997.

Quark had better watch out, since Adobe's latest PageMaker 6.5 is beginning to look attractive on both platforms. However, Adobe is the target of what is becoming an annual rant. It's none other than Illustrator, which bounds ahead on the Mac but hasn't had a Windows upgrade for years. When I meet Adobe, I comment on how much I admire the company for releasing cross-platform versions of its products almost simultaneously, then gape dumbstruck as Illustrator stumbles uncomfortably into the conversation.

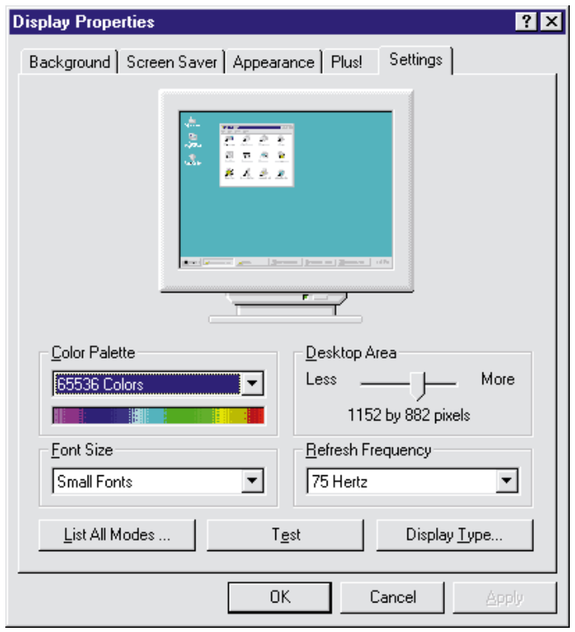
There's still no news to tell, but then, I've always thought FreeHand is a far superior product. Incidentally, FreeHand Graphics Studio 7 is due for release by the end of 1996, along with CorelDraw 7 — a battle of the heavyweight suites we look forward to reviewing soon.

In last January's Graphics & DTP column, I yearned for thumbnail preview icons for graphics files under Windows 95, in the same way that Photoshop generates them on the Macintosh. A few months later my wish was kind of granted by HiJaak 95, which certainly fulfilled the job of creating the icons but, sadly, slowed my PC to a standstill. So I removed it and racked my brains for the answer.

The solution may have arrived in the form of Photoshop 4, which generates thumbnail icons, but only for its native PSD file format on the beta copy — fingers crossed it will work on all file formats when the final is released by the end of 1996.

Photoshop 4 is another winner, despite still not offering some means by which you can quickly work on a low-resolution preview image, record the actions, then have the computer laboriously apply them to the high-resolution original while you're off doing something far more interesting instead.

Particularly welcome, though, is the new Navigation palette, which is great for finding your way around. See last month's review for more details.



Left Two wishes come true: Windows NT 4's display control panel, complete with a screen refresh rate box for a Matrox Millennium card. Let's hope 95 has this facility soon

Below Preview icons for graphics files created by Photoshop 4 under Windows 95. Great news for native PSD files in the beta

Font of the Month

Monotype has launched a package of three handwriting fonts. Until 31st December 1996, you can buy all three for £45 and even have a cool T-shirt thrown into the bargain. Pablo was created by British designer Trevor Pettit, and is based on the signature of Pablo Picasso.

Fonts in fashion

Judging by the amount of response I get each time I write about them, fonts are the in thing this year. Regular readers will be pleased to see the return of this column's "Font of the Month", following its two-month absence.

Mid-year I got quite excited about the prospect of OpenType ending the Type-1 versus TrueType font format wars, but sadly, I've heard nothing since.

Web developments have meant more typography on the internet, but this still tends to be displayed as graphics. We'll have to wait and see what happens here.

In the meantime, Adobe released ATM Deluxe which, along with cunning font management, also smooths the outlines of on-screen Type-1 fonts, using similar anti-aliasing techniques to those employed by Microsoft's Plus Pack for TrueType fonts under Windows 95.

Digital doings

1996 has seen a massive commitment by the industry to digital cameras and electronic imaging as a whole. Clearly, someone has come up with enough market research to believe that in 1997, every home computer user will rush out, take digital pictures, scan existing ones, remove unsightly blemishes on friends and relatives, paint moustaches on auntie, and output these masterpieces on colour printers.

The hardware has already started to arrive: everyone and his uncle are releasing digital cameras, while colour inkjet printers are becoming increasingly adept at outputting photographic-quality images. Sony has even announced a mini dye sublimation device for genuinely glossy prints. You want to scan existing pictures? Colour flatbeds are dropping in price, and

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Is it a heavenly usherette, or is he just doing the washing up? No; it's my Christmas card this year. I'm supposed to be an angelic DJ, spinning the righteous tunes! I've always wanted to do a stained glass window and this year toured the local places of worship for inspiration. In the end I opted not to simulate real lead, but drew heavy black lines on a sheet of paper, then scanned it in line-art mode. The colours are, in fact, real stained glass scans after heavy recolouring and manipulation in Photoshop. I selected the scans in one window, the blank areas in my original, and used Paste Into to fill. I scanned a five-year-old photo (hence the full head of hair!), upped the contrast, then applied the Photocopy filter from Adobe Gallery Effects. A little retouching here and there, and I was finished!

some manufacturers are releasing mini print scanners just for this job (see Kodak's Snapshot Photo Scanner 1, reviewed in this month's First Impressions).

Hardware for graphics users

One of the greatest but most infuriating things about the computer industry is the rate at which hardware drops in price. The good news is that today, you can buy a lot of PC for little cash. But that's bad news for anyone who bought last month, or is too paranoid to make the commitment. This is an issue for graphics users, who often need some serious equipment to do the job.

Santa delivered the goods last year in terms of hardware: 1996 saw RAM halve in price. So, vulture-like, I swooped down for the kill. I now have 32Mb at work and 48Mb at home which, although it may sound slightly over the top, ended up costing me very little. I've always recommended the upgrade from 8Mb to 16Mb, but now equally strongly endorse moving up to 32Mb and beyond. Windows 95 under 32Mb is excellent, particularly if you're using Photoshop and layers. This amount is also the ideal starting point for Windows NT 4 Workstation, about which I'll be writing more in the future.

Big bugbear

Actually, I'm reminded of one enormous bugbear which is the basis of my ultimate wish to Santa: an obvious way of altering the screen refresh rate from Windows 95's display control panel.

This is generally up to the graphics card manufacturer who should write it into the driver, yet there are surprisingly few. Those that do offer the facility also tend to hide it away, which is unforgivable. Interestingly, when installing NT 4, the system recognised a Matrox Millennium card and installed Microsoft's own driver, complete with refresh rate control — the way it should be.

Dear Santa…

My Christmas wishes this year:

1. I'd like to see RAM costs fa again.
2. In an attempt to ban flickering displays, I'd like to see refresh rates easily accessed from the display control panel.
3. Inkjets are improving, but I wish for true photographic quality.
4. Once and for all, I'd like preview thumbnails for graphics file icons in Windows 95 and NT 4.
5. I also wish scanner advertisers would stop confusing buyers with outrageous interpolated resolution claims.
6. Illustrator for Windows, and better use of Windows 95 specifics (recent file lists, right-clicks, etc) for other graphics applications like FreeHand and XPress.
7. How about low-priced, decent digital cameras to really drive the imaging revolution — a great Christmas gadget.
8. And on Christmas morning, every stocking should have an unlocked copy of Adobe's comprehensive Type CD. Now that *would* be a dream come true.

•PCW Contacts

Merry Christmas everyone! If you'd like to send any festive greetings, please email me at **gordon@vnu.co.uk**

FontWorks 0171 490 5390
Monotype 0800 371242

A **codec** message

In a step-by-step picture guide, Panicos Georghiades and Gabriel Jacobs show you how to set up audio codecs in Windows 95. Plus, your multimedia queries answered.

We have lots of your queries to catch up with this month, so let's make a start by dealing with a question sent to us by Peter Kenny. He writes: "*Your article, in the October issue, referred to a number of compressed sound-file formats. I was interested in the GSM format which is, indeed, listed under Multimedia Properties in my Windows 95 system. However, when I tried to play the GSM sample from the CD-ROM on my system, nothing happened, although all the other samples seemed to work. Do I need to do anything to install the GSM codec in my system?*

"The reason for my interest in GSM is not altogether to do with multimedia, but rather because my data/fax/voice modem (US Robotics Sportster) records all voice messages in files with a .GSM extension. I have been trying to find out about the layout of these files because I want to translate them into .WAV files that I can play through my SoundBlaster-16 card. USR has been very unhelpful. Do you know whether these files are in the GSM format described in your article, or where I can get at any documentation of GSM (preferably on the internet)?"

You can check whether the GSM compressor has been installed on your system by clicking on the multimedia icon in the Control Panel and looking under the list of audio codecs. If it's not there, you can install it from the Win95 CD-ROM. If it is there, you can check its configuration settings by clicking on it. Our file is 44.1kHz, mono. The setting for decompression should be set to All rates.

GSM stands for Global System (for) Mobile (Communications) but the initials are taken from its earlier, French, name: *Groupe Special Mobile*. The Windows 95 bumph states that GSM compresses and decompresses audio data conforming to the ETSI-GSM (European Telecommunications Standards Institute — *Groupe Special Mobile*) recommendation 6.10. The GSM 6.10 is a speech encoding system, used in Europe, that compresses 160 13-bit samples into 260 bits (or 33 bytes) — that is, 1,650 bytes/sec (at 8,000 samples/sec). A free implementation can be had on the net using ftp from **tub.cs.tu-berlin.de, file /pub/tubmik/gsm-1.0.tar.Z.**

Additionally, there are two US standards: 1016 (Code Excited Linear Prediction, or CELP, 4,800 bits/sec) and 1015 (LPC-10E, 2,400 bits/sec).

The GSM files created by your modem are probably of genuine GSM format, since GSM compression was made for telephony. But you really need to contact the people who wrote the software that comes with your modem and which creates those files, if you wish to decipher them yourself. We assume that your software doesn't have an option to convert them into WAV files. Some similar software, such as SuperVoice, does this for you.

You'll find many web sites offering GSM-to-WAV conversion programs. Do a Boolean search on GSM and WAV.

A useful reference

"*I work for a company that produces electronic books consisting mainly of text and still graphics. We are very keen to offer more video and sound in our products, but are having difficulty in locating anyone who can provide a digitising service. I would therefore be extremely grateful if you could send me a list of suitable companies.*"

Paul Cox, Oxford

See the *PCW* September issue for our review of the *Multimedia and CD-ROM Yearbook*, which contains about 1,400 businesses in the UK providing multimedia products and services. (See the "PCW Contacts" box, page 314, for details.)

Sound-card choice

"*I bought your book on MIDI, published by the Sigma Press in 1990, and I've been following the advice given in your column here in* PCW, *but I really need some help with specific questions. I've recently switched from being mainly a Mac user to owning a plug-and-play Win95 Pentium PC with Adobe Premiere, 3D Studio, and Animator Studio. I also have Roland kit from the cheap end of the range (CM32).*

"I want a sound card with good built-in wavetable sounds, versatility, stable performance and a dependable MIDI interface. Sampling is something I'd like to do, but this is only one priority.

"I've read that some cards don't have hardware MIDI interfaces but use a software TSR to emulate it. This can cause MIDI sounds to fail if another TSR overwrites it. I've also read that cards without hardware FM synthesis emulate SoundBlasters in software — that seems like asking *for setup headaches and conflicts. Although the option of digital output sounds useful, I don't know how I'd use it.*

"I'd appreciate your guidance on what to buy, and I should say I've not seen straightforward buying advice in any *computer magazine. Nevertheless, I've got a shortlist of five with some 'Fors and Againsts' that I've gleaned from reviews: it is as follows:*

1. Turtle Beach TBS2000. Good sounds, good track record, but software MIDI interface. No daughterboard connector. Not easy to get hold of and a bit pricey.

2. SoundBlaster 32. Reasonable price for average sounds, RAM for sampling, good support (I think). Many users, digital output, but software MIDI. No sequencer supplied and no daughterboard connector.

3. SoundBlaster AWE-32. As above, plus reasonable software and daughterboard connector but overpriced (in my opinion). Perhaps about to be replaced, and due for better synth chip?

4. Orchid NuSound. Good price, average sounds. Good package. Hardware MIDI, daughterboard connector (Orchid's board is only about £20) and NuPanel control panel. But sounds are not the best. No sampling, no digital output and perhaps due for a new card with sampling?

5. Gravis Ultrasound PnP. Good price for good sounds. Sampling, reasonable track record, hardware MIDI but no daughterboard connector. Software perhaps not as good as AWE and not so widely used. SoundBlaster emulation in software.

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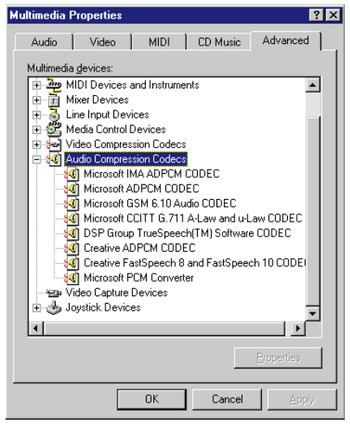
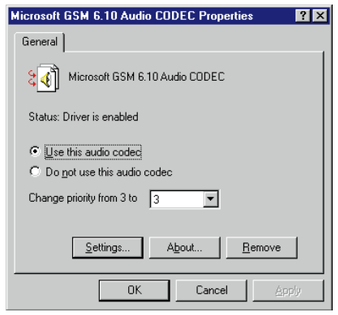
Setting up audio codecs in Windows 95 — your step-by-step guide

Step 1 (left) Open Multimedia in the Control Panel and select Advanced

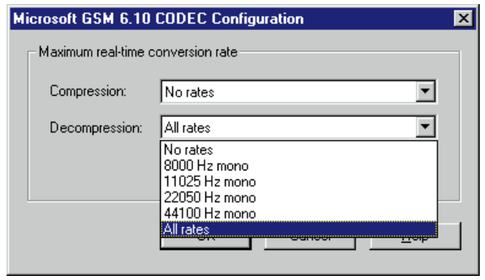
Step 2 (below) Select GSM audio compressor from the Audio Compression Codecs





Step 3 (left) Click on Settings

Step 4 (right) Use the Auto-configure button to set the Compression setting for your card and manually set the Decompression setting to All Rates. You can do this for all the other codecs



"And, while I'm asking questions: is an alternative to having a card with sampling, having an expensive sequencer which will mix synth sounds with digital audio sounds? I don't suppose it is because other software (games, Animator Studio) won't be able to play back a mixture of the two as the sequencer can."

Robert Wood
Open University

Lots of questions! We'll try and answer most of them. And thanks for those mini-reviews, although we can't comment on all the details.

Firstly, we should say that some of the views given in the articles in the magazines you've been reading are a bit dated and, frankly, not worth bothering about. Eleanor Turton-Hill's group test of sound cards (*PCW* April '96) is more up to date.

There's no need to worry about FM emulation and MIDI TSR emulation. These are related to programs running under DOS or strictly using the hardware MPU MIDI interface standard. Most cards come with Windows drivers which override, and/or render useless, any DOS drivers and settings.

The TBS2000 has the same kind of interface as the AWE-32. You can get it from Millenium Music, Tech-mate, Turnkey (see the "PCW Contacts" panel for details) and any of the Byte superstores.

The plain truth is that you won't find a single card that will do everything you want at the best quality. The best overall card which has most of what you want is the AWE-32 (the full version rather than the budget item) at about £170 (plus VAT), which is not expensive for what it offers. It's true that the on-board sounds are a bit thin, but they're no worse than the other cards you mention. A new version (AWE-64) will be out sometime in January with 64-note polyphony. An additional (more expensive) model, the AWE-64 Gold, featuring instrument modelling, will also be available in the New Year.

The best wavetable sounds we've heard on a PC card can be found on the Yamaha DB50 daughterboard (£129) which has an excellent MIDI implementation. You see, it's not just the quality of the samples, but also how much control you have over them during playback — if you want your music to have some expression, that is.

Sequencers need not be expensive nowadays to incorporate audio as well as MIDI tracks. Only if you want to manipulate your own original sounds as musical instruments (change the pitch and so on) do you need a card that handles sampling. The AWE-32 can use up to 28Mb of RAM, and there are lots of CDs with sounds for it. Steven Helstrip has reviewed some in his Hands On Sound column.

You only need a card with digital In/Out if you want to communicate with digital equipment such as an audio DAT machine. You should note that most digital cards are more expensive and don't have MIDI sounds on them.

To avoid setup headaches, go for a card for which the drivers have been around and well-tested for some time.

Dear Santa...

Before getting on to our Christmas wish list, let's take a brief look back at 1996. For us, it has been a year when computer companies have actually believed their own hype. Consequently, they have devoted huge efforts and resources to developing products for the internet. For instance, most multimedia authoring programs have had new features added to them, allowing users to create multimedia applications for the net. It has been our job to report on many of these, and in most cases we've been amused rather than impressed. Sorry, but the truth is that if you want multimedia, forget the internet. It's too slow even for still pictures, let alone sound and video. If you want to enjoy multimedia, get it on CD-ROM. Even when everyone has cable lines — with the 17Gb storage of a double-sided DVD (when it's out, if ever) — it will be decades before the internet can deliver comparable performance.

- We wish the hype over multimedia on the internet would simply stop. Last year, one of our wishes was for full-screen video. So how far have we got? The new version of Adobe Premiere boasts support for 32 x 32 pixel video output for use on the net, and we bet that kids are asking their parents for a magnifying glass for Christmas so they can view it!
- While on the subject of the net, we wish that web page designers would stop trying to show off and use less video and graphics so that pages would display faster. If you opt not to display graphics, you're left with an awful feeling that you might have missed something. We simply wish they would cut out the gizmos. After all, when you've seen one, you've seen them all.
- We wish that Windows wouldn't ask us to press OK when there's nothing else to press and things are very far from OK.
- We wish that when you get the message Abort, Retry, Fail, and you select Retry, something would actually happen other than the same message appearing again and again, until you press Abort or Fail.
- We wish there was more hardware compatibility. We've spent more days sorting out hardware incompatibility problems with Windows 95 in the last year than we care to contemplate — Plug-it-in 'n Play "solve the problem".
- We wish there were new typefaces designed specifically for reading text from a computer monitor, and that all programs (especially multimedia authoring tools) would anti-alias fonts on-the-fly.
- We wish (every year, not just this one) that companies and organisations would stop announcing products before they have dreamed of them. CD-X and DVD were announced ages ago. Where are they? And where are the large flat-screen LCDs which we can hang on our wall — the ones we were promised last decade?
- We close our eyes and wish hard for no more answerphones on customer support lines, and no more "musak". We want to talk to *real* people at the other end — people who know what they're talking about.
- We wish for more and cheaper electronic pens to replace mice.
- And finally, we wish that computer companies would concentrate on delivering what customers want, as they used to in the eighties, as opposed to concentrating on buying each other out, as they have been doing over the last five years. They've been so busy eliminating competition that they've brought stagnation to the computer industry; something which inevitably happens when there aren't enough manufacturers around.

- *Please note: this is the last Multimedia column to be included in the Hands On section of PCW, but you will still be able to read all about the various aspects of multimedia in other parts of the magazine. Panicos Georghiades and Gabriel Jacobs will continue to write for us from time to time.*

•PCW Contacts

If you have any queries, or interesting multimedia-related topics to discuss, we'll be pleased to hear from you. You can contact us at **g.c.jacobs@swansea.ac.uk** or **panicos@dial.pipex.com**

The Multimedia and CD-ROM Yearbook Macmillan General Books 0171 881 8000

TBS2000 soundcard Millenium Music, 0115 9552200; Tech-mate 01206 793355; Turnkey 0171 379 5148

The key to good **editing**

Editing is *such* a chore. Never mind: Steven Helstrip has some tips to lighten the load. He's also been wiling away the hours discovering shortcuts in Cubase — cue Christmas!

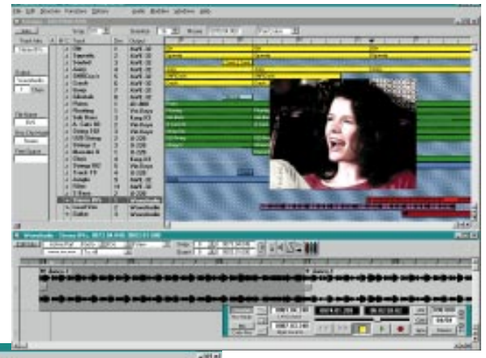
Editing MIDI events has never been my favourite hobby, and neither is it ever likely to be. There are, however, a few tricks to make editing easier. The ones I'll describe here are demonstrated using the Key Editor in Cubase, but the same principles can be applied to any piano role-style editor. Also, I'll be counting down the Christmas Tips Chart, looking back at significant software developments in 1996, and writing out my wish-list for someone I stopped believing in when I heard Take That weren't getting back together: Santa Claus.

Easy editing

It's fair to say that piano role editors are mainly used for correcting start points and note lengths. When working with more than one track based on a similar idea, multiple tracks can be viewed simultaneously by highlighting them and opening the editor with Control-E. Clicking on a note will make the part it belongs to active in the editor. Notes which do not belong to the same part are still visible, but are reduced in size. This method of editing makes it much easier to correct note lengths in relation to other parts, and is ideal for creating perfect velocity crossfades between two tracks.

The Key Editor in Cubase is also ideal for drawing and re-shaping volume and CC curves. When it is necessary to, say, create a pattern of Continuous Controllers to effect the filter of an instrument, the bottom portion of the screen can be expanded and used to display CCs graphically. To enter CCs with the mouse, simply hold Alt while scribbling in the lower division of the screen.

Entering semi-quavers, or other note lengths, on a single note can be achieved quickly using the brush tool. Select this from the toolbox, following a right click of the mouse button — particularly useful when building "cannon-fire" snare fills. The velocities of the part can then be faded using the gradient tool in the lower half of the screen.



Above Version 3 of Cubase came as a pleasant surprise in 1996

Left Drawing and re-shaping volume and CC curves using Cubase's Key Editor

Sequencers of note

Towards the end of 1995, Steinberg released Cubasis Audio, which created a new breed of application on the PC: the affordable audio sequencer. Little over £250 bought you a miniature version of the industry standard sequencer, Cubase, and the ability to record up to four stereo tracks of digital audio sampled at CD-quality. What made this even more appealing was that no specialised hardware was required, just a plain and simple sound card. Within six months, practically every known sequencer was updated to support audio tracks.

Before Cubasis Audio arrived, a similar application would have set you back around £800. Of course, this left other sequencer developers no choice but to reduce their prices, which was good news for all of us. Earlier this year, Steinberg surprised us all again when it released version 3 of Cubase. Not only was this the first major upgrade in what seemed an age, it came complete with a full-blown audio engine and 32-bit wave editing, all at no extra cost. Consequently, sequencing software fell in price again.

Logic Audio for Windows 95 is a powerful application on high-end PC hardware

Another major event of the year was the release of Logic Audio for Windows 95. Logic hasn't been too successful on the PC, since it has always been a demanding application that only comes into its own when placed in complex MIDI setups and alongside pro audio hardware. As the Mac seems to have been graced with better audio hardware, it has attracted many Logic users. Now that more high-end hardware has become available, however, PCs that are equipped with Logic are better suited to power users.

Cubase shortcuts chart

I've been having fun discovering new shortcuts in Cubase. And rather than just keep them to myself, I thought I would compile a Christmas 96 Top Ten Short Cuts Chart. You could have some fun over the festive season just trying to say it.

10. And straight in at ten this month, it's that old favourite, Control-Alt-P. This will swiftly position the left and right locators around a selected part, or parts, in the arrange or edit windows.
9. Climbing seven places, the asterix key secures number nine. In a moment of inspiration, asterix will kick Cubase straight into record mode.
8. At eight, it's Shift and PgUp/PgDn for the quickest way to fast forward and rewind through your tunes.
7. Down four places to seven is double click in the arrange window while holding shift. This will select every part on a given track.
6. A non-mover at six is Control-K, to copy parts.
5. At five, Control-Alt-Z will take you to the last part within an arrangement.
4. At four it's another Control-Alt key combination, this time with the letter I. This will hide/display the track info column, which is useful when you need to free up space on your screen.
3. A new entry at three is Alt and the Scissors Tool. When you need to splice a 16-bar part into, say, one-bar sections, hold down Alt while cutting within the first bar of the part. If you need to join the parts together again, this can be done while holding Alt and clicking with the glue tool.
2. Holding at number two this month, it's plain and simple G and H. These two keys enable you to zoom in and out of your arrangement on the horizontal axis. With Shift held down, you can zoom in and out on the vertical axis.
1. And finally, at the top of the Christmas Top Ten Short Cuts Chart, it's shift and function keys 2-12, which allows you to store current left and right locator positions. To recall the locators, simply recall the function key where it was stored.

Dear Santa...

Firstly, Santa, can you explain why Cubase now requires 12Mb of disc space just to install? Less than three years ago, I ran Cubase from a low-density floppy and still had enough space to save a handful of tunes. What's going on?

One of my least favourite pastimes is spending hours sifting through sampling CDs to find the right sounds or textures for the tracks I produce, so what I'd really like to find beneath the tree this year is the definitive sample collection. It should contain 30 or so snares, kicks and hats to match with warm pads and deep, fat basses that'll make any track rock. How about a belltree sample? They're nice this time of year. The CD should have no vocal hooks — they are *always* dreadful. After all, if somebody comes up with a half decent tune, why would they give it away for somebody else to exploit?

A 21in monitor would be nice, too. And a cordless mouse and keyboard. If the mouse never needed to be cleaned, that would be much appreciated.

And finally, Christmas wouldn't be the same without a Terry's Chocolate Orange. So if you don't mind. Cheers!

•PCW Contacts

If you have any hints or tips, MIDI-related items or general comments, send them to the usual *PCW* address, or to
steven_helstrip@pcw.ccmail.compuserve.com

Spare **parts**

Tim Anderson compares components for Basic and Delphi. Plus, for those who can't see the wood for the trees there's a guide to choosing a visual programming package .

Visual programming means dropping components into your application and making them go by setting properties and calling methods. That, at least, is the plan and here is an evaluation of some recent components. Your views matter most though, so please let me know which components work well or badly for you.

Crystal Reports 5.0

Crystal Reports is hard to avoid, being widely bundled with products like Visual Basic and Visual dBase. Seagate naturally hopes that users of these bundled versions will want to upgrade. Version 5.0 is the latest release. The Standard version supports most desktop database formats like dBase, Access and Paradox, while the Professional version adds full ODBC and various native SQL formats.

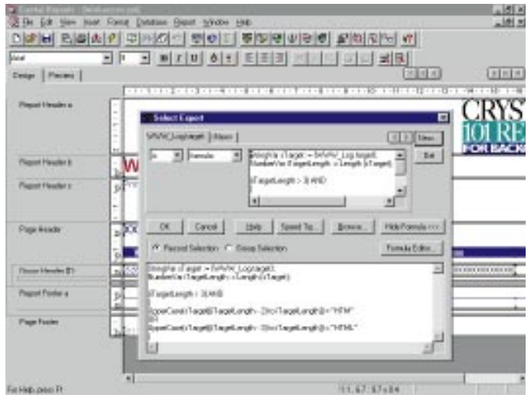
There is a new interface for designing reports, with better drawing features and in-place OLE editing. Of most interest to developers is the new sub-report feature, which enables you to insert a report within a report. Normally, this would be linked to the main report for displaying child records, but it can also display unrelated data. Another new feature enables you to export HTML for adding to web sites.

Crystal is a powerful tool and has components for most development languages including 16- and 32-bit Visual Basic, Delphi and C++. But I do have reservations. One is the sheer size of the product: the main print engine is now over 3Mb; another is that Crystal has its own formula language and although reasonably capable, it is ugly and old-fashioned. Nevertheless, version 5.0 is a significant upgrade and developers with better things to do than write their own report engine will find it invaluable.

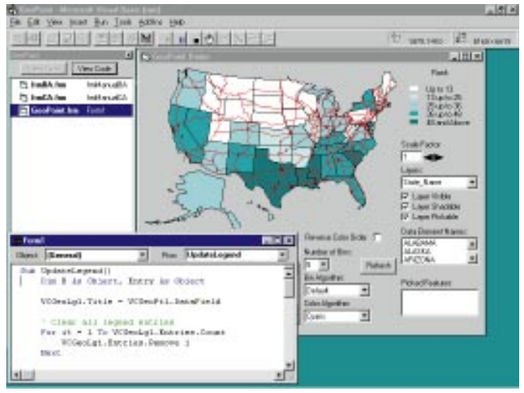
GeoPoint 1.0

Visual Components is responsible for some of the best ActiveX components around, including Formula 1 and Visual Writer. GeoPoint is a more specialist control. It displays maps in MapInfo or Autocad format. By using it alongside the separate Legend control, you can programmatically control the text and shading of each area of the map. A technique called "binning" lets you categorise data into ranges, and then shade the map accordingly: a typical example would be a display of sales performance by region. The user can also select an area of the map by clicking, so the application can show related data. GeoPoint can be bound to a data control to display your data.

This useful component is spoilt by its presentation. There is no printed manual and the online documentation is poor. The other snag is that the few supplied maps, heavily biased to the USA, are not likely to be what you want. That means purchasing add-on maps, or buying MapInfo or Autocad to create your own. Making full use of GeoPoint will be expensive.



Above **The Crystal Select Expert lets you create custom fields using the formula editor**

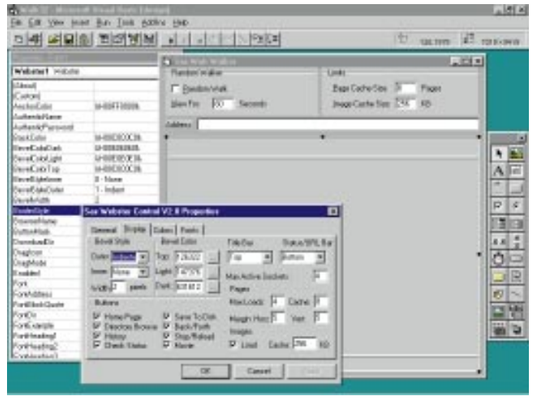


Right **GeoPoint is a neat tool with which to analyse geographic data, but its USA map will not be of much use in the UK**

Sax Webster or Internet Explorer?

The Sax Webster control displays HTML documents. Now at version 2.0, it comes as 16- or 32-bit OCX controls that you can drop into your application.

It is easy to use. You can, for example, display a web page by setting the PageURL property. The main change from the first Webster control is the HTML version supported, now version 3.0 but without frames. It works well and may be useful on 16-bit systems or where a small memory footprint is required. Otherwise, on 32-bit Windows a better option is Microsoft's freely available Internet Explorer 3.0. In Visual Basic 4.0, open the Custom Control dialogue and check Microsoft Internet Controls. This installs the WebBrowser component which is the HTML display part of Internet Explorer. It is just as easy to use as Webster, and far richer in terms of HTML support. You will need to get hold of the Internet Explorer object model, which is part of the ActiveX SDK available on the Microsoft web site.



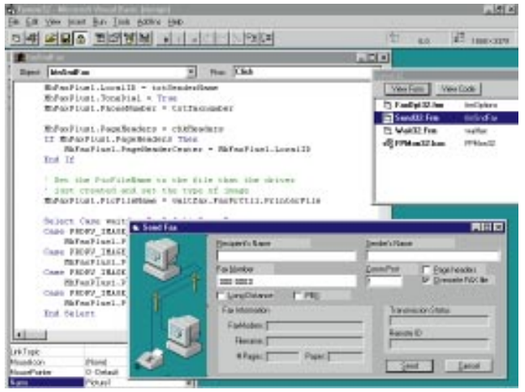
Left **Sax Webster: it works, but why not use Internet Explorer instead?**

Below **FaxPlus: does it have to be so complicated?**

Microhelp Fax Plus

Fax software may not be exciting but it is exceptionally useful, at least until the whole world gets webbed.

Fax Plus 2.0 is the new 32-bit version of Microhelp's Fax add-on. It is designed for Windows 3.1 and 95, but not NT. It consists of several controls, including a fax control that handles communications, and a FaxImage control for creating and modifying fax bitmaps. There is a printer driver and control which lets you send faxes by printing from any Windows application. The Fax Plus driver creates a fax image and then fires a StartDoc event in the printer control, so that your code can handle sending the fax.



Unfortunately though, using FaxPlus is not as easy as it should be. In part this is because of fickle telephone lines and diverse hardware that turn faxing into a trouble-prone business. Other problems are down to FaxPlus itself, which is awkward to code and not entirely bug-free. For instance, at the time of writing, the VBX version is unable to correctly convert text files to fax images. Still, it beats trying to write your own fax driver.

Microhelp VB Viewer 2.0

VB Viewer is a product of limited ambitions. Drop it onto a form and you can use it to display files of around 30 different types, including multimedia files. With text documents you can search for text and

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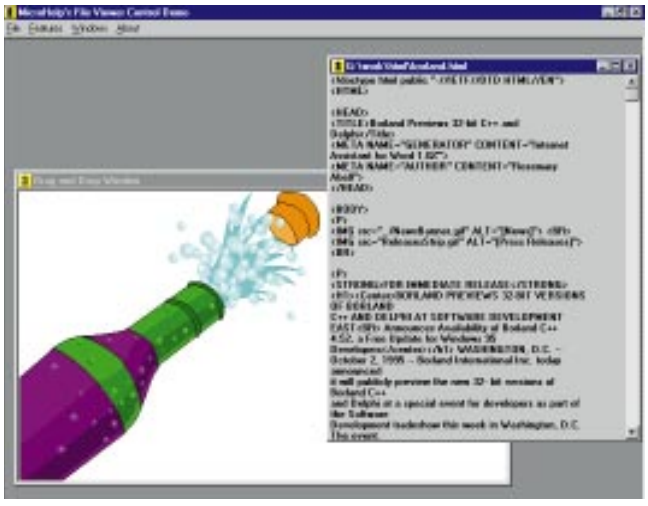
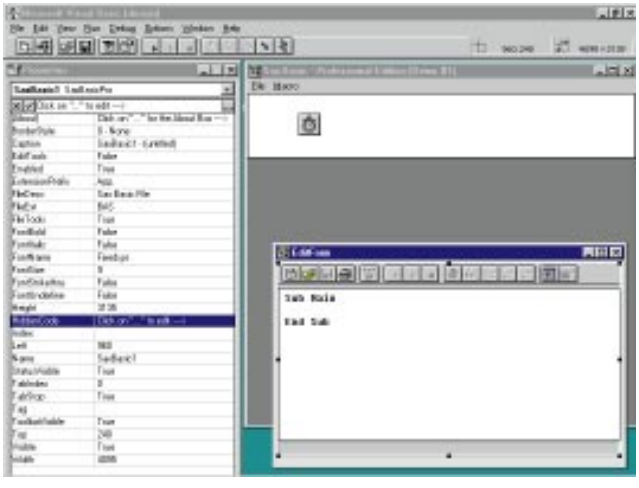
How to choose a visual language

Shaun Nicolson writes: "*I am considering buying a visual programming package but cannot decide which one. I am considering Microsoft's Visual Basic and Visual C++. The language I choose would have to produce network applications. What are the pro's and con's of these?*"

1. Ease of use. This is where Visual Basic scores highly, since you can have a simple utility up and running very fast. That does not mean VB will be the easiest for a large, complex application, since many other factors will then come into play. Delphi also scores well, while Visual C++ is hard to learn with limited visual tools.
2. Performance. This is where languages that compile to native executable code, like C++ or Delphi, generally win over interpreted languages like VB, FoxPro or Java. Database processing speed should be judged separately as all products use fully-compiled database engines. In some applications, performance is not an issue, or is determined more by factors like graphics or hard disk speed rather than the language used.
3. Power. The developer's nightmare is to spend months on a project, only to find that some intractable problem means that it cannot be completed with the current tool. Visual Basic is vulnerable since some features of Windows like callback functions or custom message handling are not available. There is usually a way around it by using a custom control or DLL but these must be written in another language. Version 5.0 should solve some of these problems. If you dread brick walls, C++ is the safest option, with Delphi a close second.
4. Database engine. Most languages have a native database engine, along with the ability to connect to other databases via SQL libraries or ODBC. If you know which database you will be working with, good connectivity is the first thing to check.
5. Availability of add-ons. This is where Visual Basic scores best. Most VBX and ActiveX controls are designed for VB, and may not work well elsewhere. There are also plenty of code libraries for C and C++, but native add-ons for other languages are more limited.
6. Reusable code. To protect your investment, you want to write code that will be reusable in future projects, perhaps even on other computer platforms. This is one of the benefits of object orientation, with Delphi scoring well, C++ fairly well, and Visual Basic less well. Best of all is Java, which forces you to write object-orientated code and runs on multiple platforms.



Left VB Viewer can manage a picture, but struggles to display HTML



Below A language within a language, Sax Basic lets you deliver programmable applications

copy to the clipboard. But overall, VB Viewer is a disappointment. One let-down is that formatted documents in word processor formats are displayed as plain text only, unlike the much better QuickView utility that comes free with Windows 95. Some basic formats like HTML and Rich Text Format are not supported at all. You can set VB Viewer to use QuickView viewers, but files then appear in the QuickView window rather than embedded in your form.

Sax Basic Engine

One way to impress users is to supply an application with its own macro language, like Excel or Word. The Sax Basic Engine lets you do just that. The control has its own IDE, so getting started takes little more than placing it onto a form. The language itself is compatible with Visual Basic for Applications, with excellent support for OLE automation and class modules.

To make Sax Basic useful, you need to extend its language to communicate with your application. The way to do this differs, depending on whether you use the VBX or OCX version. With the VBX, you can add keywords that fire an event called AppExec. You can then write code using Select Case to interpret the command. The OCX version has a more elegant solution. You write extensions in a VB class module, and then add them to Sax Basic using the control's AddExtension method. If your application needs a macro language, Sax Basic is ideal and a lot cheaper than licensing the genuine VBA from Microsoft.

Visual Basic

MT Emms writes: "*Using Paint I've created four BMP files. Each is divided into four sectors, the other three being left transparent. I have written a program to merge these bitmaps into one but the last one dominates — in other words, the transparent sectors are not transparent. It was simple on the Mac and Archimedes; surely VB should be able to cope?*"

Visual Basic *can* cope, but it is not as simple as it might be. The secret in this case is to use the PaintPicture method, on either a form or a picture box. The syntax for PaintPicture is:

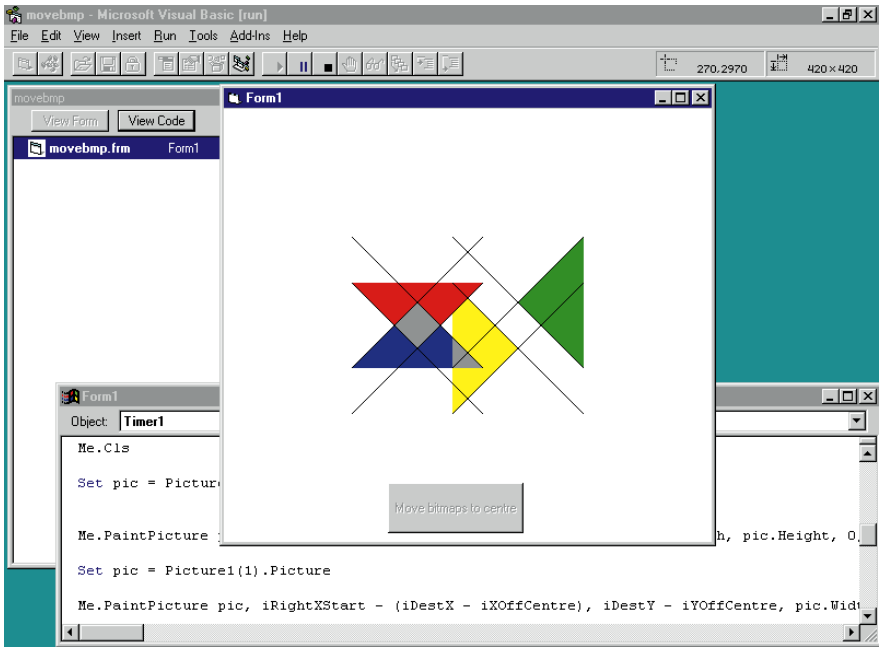
```
object.PaintPicture picture, x1,
 y1, width1, height1, x2, y2,
 width2, height2, opcode
```

The final parameter is a long value that defines a bit-wise operation which is performed on the picture as it is drawn. As the VB manual remarks, you can find a list of these operators in the BitBlt topic in the Windows SDK help.

The easy way to use them is to define them as constants in your VB application. For example:

```
Const SRCAND = &H8800C6  ' (DWORD)
 dest = source AND dest
Const SRCCOPY = &HCC0020 ' (DWORD)
 dest = source
```

If you then call PaintPicture with the SRCAND constant value, the bitmaps will merge in the way Mr Emms requires. Yes, it is more like programming in C than in Visual Basic, but at least it does the job. An example application is on our cover-



Merging bitmaps using VB and the SRCAND bitwise operator

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mounted CD, which also shows how to move the bitmaps across a form for an animated effect.

Delphi departure

In October, Anders Hejlsberg, the chief architect of Delphi, announced his departure from Borland for the safe pastures of Microsoft. Zack Urlocker, another key member of the Delphi team, has pointed out that "the architectural work that Anders covers is complete for Delphi 97. Anders' departure won't affect the shipping date or features going forward."

Even so, Anders is widely seen as the man without whom Delphi would never have happened, so his move is significant news. If anyone can knock VB into better shape as an OO language, he must be the man. Although Delphi is as good as ever, this weakens the case for migration from Microsoft tools. Personally, I hope that Borland can sustain Delphi's momentum, as it still delivers the best combination of rapid development, power and performance.

Dear Santa…

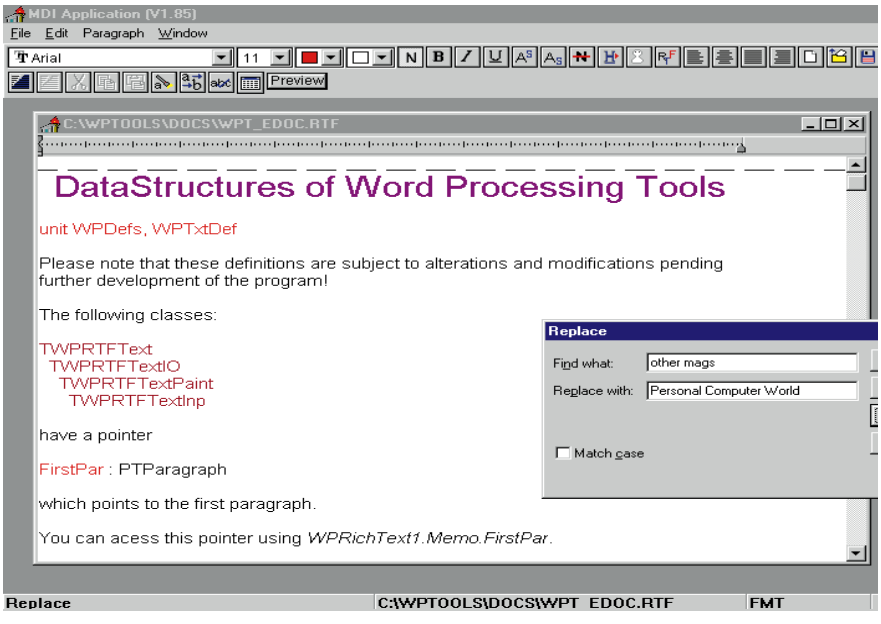
Sensible developers want an easy life. That means fast application building, reusable code, blinding performance and results that run everywhere. Well Santa, it seems you have a habit of giving with one hand and taking back with the other. Last year I asked for an end to the OS wars: a fanciful request, perhaps, but twelve months on and Java may provide an answer. Except that (dear Santa), we need easier, richer interface building, better performance, and decent support for platforms which Java finds difficult, like Windows 3.1 and the Macintosh. In the meantime, even developers who fix upon Windows have three versions with which to contend.

Forget the platform, then, let's look at the tools. First, there's Visual Basic, still the most popular all-round Windows language. Last year's wish-list included a compiler and better OO. The signs are that VB 5.0 delivers some of that, although it will never have the elegance of Delphi's component library. But Office 97 and VBA 5.0 are great news for developers of Office solutions. Thanks, Santa. And thanks for Optima ++, which is real visual development for C++ at last.

While I have your attention, there are a few things I'd like in my stocking for next year. Top of the list has to be a faster, better-organised internet. The web is irresistible for developers, both for technical support and as a platform in itself. But it has to get quicker and more reliable. *Please.*

Second, an un-present: Windows 3.1, please take it away. It's as bad as DOS, but worse, because people with working Windows 3.1 installations see no reason to change. I understand their point of view, but for developers this is a disaster. Develop two versions, with all the extra costs? Develop 16-bit only and waste all the advantages in 95 and NT? Develop 32-bit only and forget half the market? Hmmm, did I hear someone mention Java?

Third, I'd like better tools for troubleshooting OLE, ActiveX, COM, call it what you will. It's funny how quickly a Visual Basic 4.0 installation produces an "object server not correctly registered" message when you install custom controls. It means a registry problem and there's no easy way to fix it. This highlights a problem that will get worse if ActiveX continues to grow.



WP Tools is a fully-featured, shareware-rich text control for 16- or 32-bit Delphi

Word processing tools

Some months ago I mentioned a shareware product called WP Tools, a native Rich Text control for Delphi. On closer inspection, I am impressed. The feature list is good, with support for merge fields, graphics, tables and hyperlinks. The range of controls has a lightweight rich text label and a data-aware text box as well as the usual word processor, toolbar and status bar components. In tests, it has proved fairly reliable, though not entirely bug-free.

The advantage of WP Tools is that as a native VCL supplied with source, you can track down bugs and amend the code if you can work out what is going wrong. Another benefit is richer functionality. You can access the data structures for both text and formatting, giving a fine degree of control. The Finder class offers sophisticated search and replace, including formatting properties. You can print to a canvas control in order to implement page preview.

Performance is good, on a par with rivals like Visual Writer, AllText and HighEdit. If you are developing for 16-bit Windows, a custom component is all but essential for working with formatted text, while even in Windows 95 and NT it has advantages over the built-in rich text control.

There are problems. This is shareware, and the documentation is unclear. Advanced users need to be comfortable with such things as streaming and pointers, as WP Tools uses them extensively. To succeed with this product, you must be willing to pore over the source and not be put off by the odd mixture of English and German comments in the code. The extra effort and risk is rewarded by a product that works rather well.

•PCW Contacts

Tim Anderson welcomes your Visual Programming comments and tips. He can be contacted at the usual *PCW* address or as **freer@cix.co.uk**

Components listed below are available from: **Contemporary Software 01344 873343; Grey Matter 01364 654100; and QBS 0181 956 8000.**
Sax Webster £110 for the 16- or 32-bit version (£175 for both), plus VAT.
VB Viewer £110 (plus VAT)
FaxPlus £195 (plus VAT)
Seagate Crystal Reports 5.0 Standard £199, Professional £299 (both plus VAT)
Sax Basic 3.0 Pro £345 (plus VAT)

GeoPoint 1.0 costs £195 (plus VAT) from **Visual Components 01892 834343**
WP Tools is $119 to register, available via CompuServe, or from the web at **members.aol.com/JZIERSCH/wptools**

Stack 'em high

Mark Baynes' new guide to networking terms begins with an explanation of the OSI stack: it puts the 'work' in networks.

Panic over! No sooner had the HP Colorado T4000-S tape drive arrived than I ran down to the shop and bought a TR-4 Travan mini cartridge. I slammed — sorry, I mean carefully installed — the T4000-S into my dodgy server, Palace Pier, and within a few minutes was happily backing up three years' work. Actually, when I say "slam", I mean fiddle around for 20 minutes or so.

The T4000-S comes as a kit with DOS, Windows 3.1 and Win95 software (for more details on the T4000-S see my review panel, page 328) but I wanted to run and install it on Palace Pier under NT Server 3.5. The network card on Palace Pier wasn't working so there was little point in installing the T4000-S on my PC, and even if the network card in Palace Pier *was* working, the T4000-S is a SCSI-2 device and, firstly, my PC isn't SCSI-enabled, and secondly, I didn't have a SCSI-2 card to make it so.

I first had to go to HP Colorado's web site to download the appropriate NT drivers. Having got these, I realised that I needed to upgrade the server firmware, and having got the necessary utility from the same site, ran it and then installed the NT driver. Next, I used the standard backup facility, which comes with 3.51, to backup all my data files to the tape. I could then begin to breathe again and set about scrubbing the server hard disk, removing the T4000-S from Palace Pier and installing it into West Pier, then restoring the files from the tape to the server's hard disks so I had two copies.

There was still the problem with the network card on Palace Pier. Because the card had given me no trouble whatsoever for the last 18 months until, that is, I started faffing about with Palace Pier, I should have reasoned that the cause of the problem was Yours Truly. But I didn't. It wasn't until I was on the phone to technical support that I realised the cause of the problem was that I had somehow managed to set the interrupt for the card to 15 — which the on-board Adaptec SCSI rightfully wanted all to itself. Setting the card interrupt to 5 duly solved the problem and I was ready to install NT Server 4.0. At some point, I had managed to set the PCI configuration to its default setting — pretty stupid really, so please don't tell anyone.

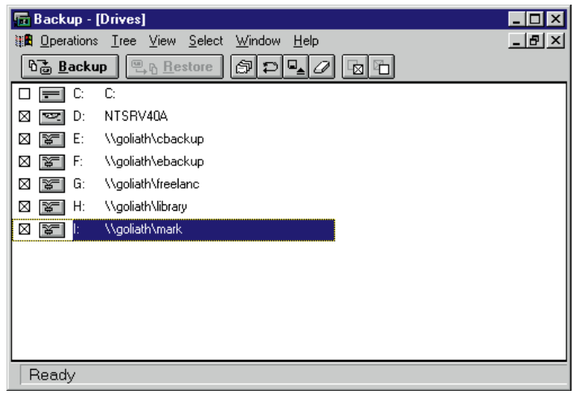


Fig 1 **MS Backup is plain and simple but it does the job… just about**

Even though I now have a tape drive in place, I still don't have a proper backup routine. I would prefer to get the tape drive out of any one network node and hang it directly off the wire. I have the same situation with my HP DeskJet 600 which has done sterling service in the last few months, printing off five 20,000-word dissertations without a glitch. At the moment, it is directly attached to my main PC which acts as a print server, but I would prefer to use a separate print server and be able to hang it straight off the network rather than having to attach it via another device. More on this next month.

Danger — philosophers at work

I am a great believer that people who are into the technicalities of computers and networks are rather like philosophers: although they quite often use terms they do not understand, they are still capable of having meaningful conversations; and because everyone thinks that everybody else *does* know what they are talking about, they are afraid to ask the really basic questions. The problem is that some people go on for years using terms which they cannot explain.

Working on this basis, I thought I would devote some time over the next few issues to explaining some of the really basic networking terms. If you are a real expert or just a plain smart-arse, you can devote your attention to other parts of *PCW*; but if there are gaps in your knowledge, read on. I will not attempt to give complete explanations of every networking term and concept, but I will do my best to provide enough information to provide you with a basic understanding which will hopefully improve both your theory and practice of networking.

OSI Seven-Layer Protocol

One of the most common terms that is bandied about, yet poorly misunderstood, is the dreaded OSI (Open System Interconnect) stack a.k.a. the OSI Seven-Layer Protocol defined by the ISO (International Standards Organisation). If you spend your days running and building LANs, you won't need to know a great deal about this. The simple fact is that without it, networks would not network. It is the most basic networking standard that allows one system to talk to another.

A developer, developing the latest and greatest networking widget in the sunshine state of California, knows their widget will work with the next latest and greatest networking device being built by a developer working underneath a railway arch in Peckham because they will be designing them to work with the OSI stack.

Networking life would be much easier if every network used the same protocol but, in the networking industry, getting everyone to agree to using the same data-communications protocol would be like getting all the hardware manufacturers to agree on the same hardware architecture — impossible. The pragmatic alternative is to have a standard way of translating between different protocols and hence the OSI stack.

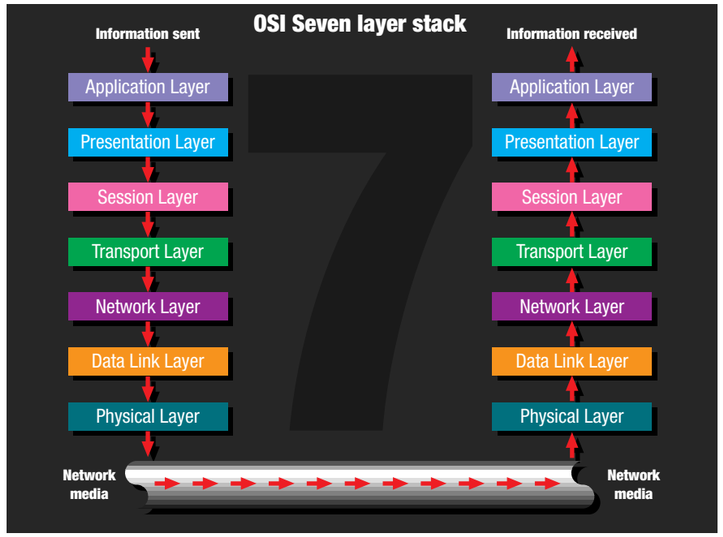


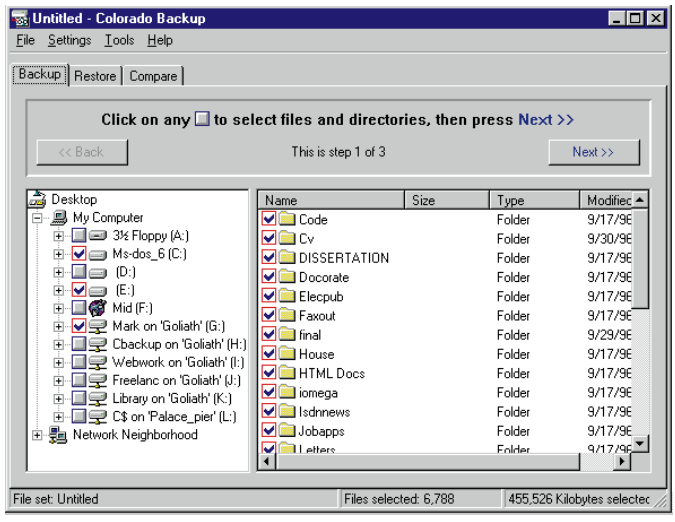
Fig 2 **The OSI stack: if it didn't exist, we'd have to invent it**

Standards Committees

- American National Standards Institute (ANSI): members of ANSI are manufacturers, users and other organisations with an interest in standards. They devise stuff likel ASCII (American Standard Code for Information Exchange). ANSI is a member of the International Standards Organisation (ISO).
- Comité Consultatif Internationale de Télégraphique et Téléphonique (CCITT): an agency of the ITU whose members include telecommunications agencies, scientific and industrial organisations and the ISO. Some of its most well-known and commonly-used standards are the X series which is concerned with network interfaces and public networks like X.25 and X.400, and the V series which deals with telephone communications like V.21 and V.22 modem standards and such like.
- Electronic Industries Association (EIA): members manufacture telecommunications and electronic equipment. The EIA is a member of ANSI and sets standards such as the much-loved RS-232.
- Institute of Electrical and Electronics Engineers (IEEE): usually known as the "I triple E", its members are computing and engineering professionals and it is responsible for setting standards such as the 802 series for local area networking.
- International Standards Organisation (ISO): international body whose members include other standards organisations and whose most important work in the computing and datacommunications field is on open systems, including the OSI stack.
- National Institute of Standards and Technology (NIST): a US Government agency which develops a variety of standards, including the data encryption standard (DES).

p328 ➢

HP Colorado T4000-S



Colorado Memory Systems is a division of Hewlett-Packard, hence the slightly confusing product name. The T4000-S comes as part of a kit which includes the tape drive itself (standard 5.25in size), four installation screws, and two installation disks with DOS, Windows 3.1 and Win95 software. There is a 66cm long SCSI cable, software and installation guides and, according to the blurb on the box, a free tape (which mine didn't have). The default SCSI ID setting is four but if you need to change this the manual shows you how to reset the jumpers on the drive. If the tape drive needs to be flagged as unterminated, you have to remove three sets of terminating resistors from beneath the rear of the drive, for which you will need a pair of needlenose pliers, then slide it into a spare bay in your PC or server, connect the power and SCSI cables and reboot. I discovered that once I had the correct NT 3.51 drivers installed, using the vanilla NT backup software was quite straightforward. NT 4.0 recognised the drive immediately and I encountered no problems with the T4000-S during the month that I carried out backups at least once a day.

Whether you install this tape drive on a networked PC or a server you will, of course, be able to back up data from right across the network. And, having a capacity of 4Gb uncompressed and 8Gb compressed, it should be able to cope with most small LANs. There are also external, dedicated network and parallel port versions of the T4000 available.

PCW Details

HP Colorado T4000-S

Price £321 (plus VAT)
Contact Hewlett-Packard 0990 474747

A good analogy for a data-communications protocol is a letter. Everyone knows that the agreed format for a letter is the address at the top (43 Acacia Avenue), the salutation (Dear Frank…), the main message (I want to thank you for…) followed by the signature (Yours faithfully…). This is a simple protocol, in the same way that you say "Hello" when you meet someone rather than when you are just about to leave them. Datacommunications protocols are set by standards committees (see the panel, "Standards Committees", on the previous page) who spend many a happy hour doing the boring work so our networks can talk to each other. Essentially, if the OSI stack did not exist, we would have to invent it.

Stack 'em high

Every layer in the OSI stack communicates directly only with those layers directly above and below it (Fig 2): the highest layers dealing with user services and the lowest layer dealing with the physical nature of the transmission medium itself.

The seven layers of the OSI stack can be sub-divided into two groups, with the transport layer acting as a bridge between them. The application, presentation and session layers deal with end-to-end communications and are not bothered with the minutiae of the details of data transmission. The network, data link and physical layers at the bottom of the stack deal with the nitty-gritty of specific network communications, and the transport layer is the bridge between the two groups.

The OSI stack is a model and as such not all protocols adhere to it precisely, but it does provide a common reference model: ■ 7 Application Layer. This is not a user application (such as Word, Notes, and so on) but it does deal directly with applications in terms of providing services such as email and file transfer.

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Dear Santa…

I know you are getting on a bit now and you are very busy at this time of year, but do you remember what I wished for last Christmas? What I wanted was a cut in the cost of Basic Rate ISDN (also known as ISDN-2) installation by BT from a rip-off £400 down to something a bit more realistic so I could actually surf the net instead of doing doggie-paddle. Of course, I didn't want the cut in installation costs just for me and my friend up the road, but for the whole of mankind or anyone with a vested interest in networking in the UK. I reasoned that if the price of ISDN-2 was reasonable, loads of keen individuals and businesses would get it installed and it would really get the UK networking scene moving. Not just the business side of things but also stuff like community networks.

What did you get BT to do, you old duffer? Yeah, so they cut the prices of *some* ISDN-2 installations from £400 to £199 but then they put the cost of the rental up! What were you thinking of? I know that, at BT, those in charge of ISDN have their Christmas wish lists as well, but as I got mine in early (around February if I remember rightly) I thought I would get priority treatment. I did leave you those really nice sandwiches and that glass of sweet sherry out on Christmas Eve. By the way, sorry about leaving the fire blazing away in the grate.

So this year, I want broadband modems for every house in the land. Yep, more bandwidth than you can shake a stick at, for everyone, right into their home via their cable television set-up. If you can do this, then within a few months most families will be interacting with each other in real time and putting their holiday videos up on the web for everybody else to see. Now wouldn't that be interesting?

At the moment, the craze is for 33.6Kbits/sec modems, the trouble with this being that a 28.8Kbits/sec modem is pushing the capacity of an ordinary telephone line to the limit so buying a 33Kbits/sec version is pretty much a waste of money. However, if you ask BT nicely it will tweak your line for you. Broadband modems, on the other hand, can shove huge amounts of data around: a cable modem can do 30Mbits/sec, while ADSL (Asymmetric Digital Subscriber Line) modems using the telephone lines can do 9Mbits/sec which is still pretty quick. The trouble is, there is no point in you delivering a neat little black box to everybody on Christmas Day if the communications infrastructure isn't there to support it. But when it is, just think — neighbourhood pitted against neighbourhood in the ultimate game of Quake!

■ 6 Presentation Layer. Carries out formatting and security tasks. The presentation layer at one end of a secure file transfer would encrypt data while the presentation layer at the other end would decrypt it with the user being unaware this was happening.

■ 5 Session Layer. Deals with starting, maintaining and stopping sessions between network nodes, especially synchronisation of sessions and error recovery.

■ 4 Transport Layer. Lowest layer that deals with communications — the three layers below deal with the network itself. Sorts out which particular way to transport data and packet transmission.

■ 3 Network Layer. This sorts out routing strategies. It is fundamental to the efficient working of complex topologies as it works out the best route through the system.

■ 2 Data Link Layer. Uses error detection and correction techniques to ensure that transmissions between network nodes are error-free either by correcting the error or requesting a new transmission.

■ 1 Physical Layer. The lowest layer needs to know the physical nature of the transmission media. For example, is this communication being transmitted over copper or fibre-optic? Sends and receives bits without comprehension of their validity and passes them up to the Data Link Layer.

Bandwidth on demand?

I have finally taken the plunge and allowed BT onto the premises to install my ISDN-2 line. Sod's Law says it looks like I will have to lift up the floorboards in the living room again to run the cable through to my study, but fortunately, the fact that I cannot afford a new carpet yet means that I will just have to shove a couple of rugs out of the way. Will ISDN-2 be worth it? Will my ISP be able to satisfy my insatiable bandwidth demands? Does anyone *care* apart from me?

PCW Contacts

Mark Baynes is a web developer and IT journalist based in Brighton. He can be contacted as **markb@pavilion.co.uk**

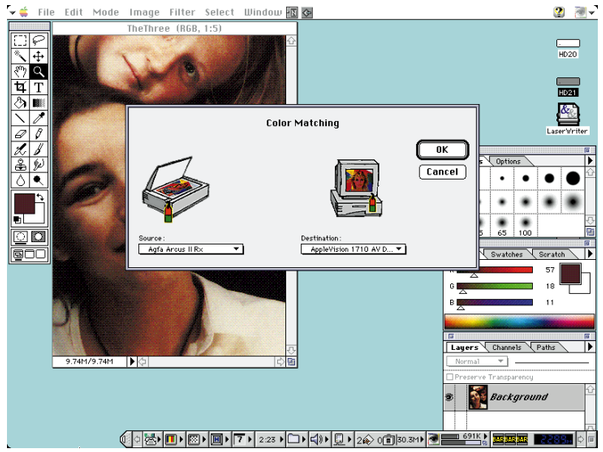
Lying in **wait**

Howard Oakley remains laserless and disillusioned with Apple shipping delays, so to cheer himself up he considers buying a colour scanner. Plus, top ten SCSI tips.

It is frustrating when a product is available yet for the lack of something simple, it cannot ship. Last month, I was still waiting for my new Apple LaserWriter 12/640PS duplex printer, which was to have been delivered imminently. I am still waiting. The delay seems to be because there is no 500-page sheet feeder — a few bits of plastic which condemn me to plod on with my old and highly simplex LaserWriter II.

Similarly, Apple promised many of us its Apple Internet Connection Kit as recompense for the demise of eWorld last spring. Although I have seen and touched this product in the USA, the closest I've come to it here is a series of apologetic letters promising its eventual arrival and tempting me with web sites which I already know, from my long-standing use of the internet, to be overused and choked. A few copies of version 1.0 of the Kits were distributed to dealers but the production run was quickly terminated. I now await version 1.1.5, which is promised for delivery in a few days' time.

Software support for the Agfa Arcus II scanner is nicely integrated into Adobe Photoshop, and supports professional-quality colour management



System 7.5.5

Apple has been skipping version numbers a lot recently, a worrying trend. Not only has the near-legendary Internet Connection Kit mysteriously leapt from 1.0 to 1.1.5, but we are now being tempted to upgrade from System 7.5.3r2 to 7.5.5, missing an ill-fated 7.5.4. Needless to say, our friends in the US (we should admire their fortitude as beta-testers for later European versions) have been reporting many bugs and incompatibilities, including an accepted inadequacy in the size of the Finder's heap allocation. Thankfully, John Brisbin has produced a control panel, prosaically called "Finder Heap Fix 1.0.1", which fixes this, so if you are brave enough to make the leap to 7.5.5, only to discover the Finder whingeing about there being insufficient memory, download this from an internet archive or CompuServe and rejoice for John's kindness in the face of Apple's myopia.

Although 7.5.5 does have some incremental improvements, including LaserWriter 8.4 and Apple's first serious attempt at high-performance virtual memory I might, for once, watch the dust settle a bit before upgrading.

System 7.6, and 8.0?

News of Mac OS 8 is more encouraging now. System 7.6, internal codename "Harmony", looks due to ship in January, the next step on the long road to OS 8.

What is certain is that it will not incorporate the new customisable human interface which has been so widely touted since we first got to learn of "Copland". Apple has justly taken great pride in the Mac's human interface, in spite of gathering criticism that it is now old-fashioned and less rich than other, more recent, pretenders. Rather than betraying its principles, it has now decided to hand over power to the user. Knowing, from meticulous experimental work, that clean and impeccably-designed interfaces are most productive, it is giving us the choice of whatever else we want. This is accomplished by the user setting preferences which then become their personal flavour for the interface.

When we can finally enjoy Mac OS 8 in its fullness, we will be able to make it look and behave more like Windows (of 3.x or 95, if not 97, variety), any of the range of Unix windowing front-ends, or whatever. Controls should extend beyond mere appearance, but include some of the features currently offered in At Ease, for instance. A range of standard flavours, intended to start different types of user on their personal quest for GUI nirvana, should provide ideas.

Scan and SCSI

Having been prevented from enjoying my first duplex printer, I had urgent need of a good colour scanner, and was tempted into buying (a novel concept, perhaps) an Agfa Arcus II flatbed model. Not only is this a capable beast which makes my old greyscale OneScanner look like an ageing toy, but it also reminded me of the vagaries of the SCSI standard and the black art required to successfully install a new device.

At first, I hooked it up to the external SCSI bus of my Power Mac 9500 as the sole device. As Agfa provides only one Centronics-type SCSI connector on the Arcus, I placed a terminator between the cable and the scanner: a standard way of ensuring that the bus was correctly terminated at both ends. The 9500 took grave exception to this. Although it powered up perfectly, the auto-sensing AppleVision 1710 monitor decided that there was no video signal, and refused to turn on.

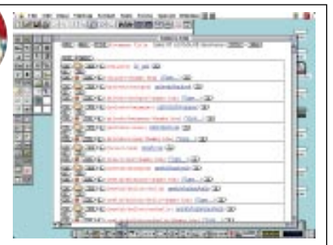
Driving a Mac without a mouse can be tricky, but when you cannot see the screen at all it is a true test of ingenuity. I could hear the rattling of drives as various extensions were loaded, including FWB's rumbling hard disk callisthenics. Then all went quiet, as the invisible desktop awaited my command while I wondered what to do next. If I shut the power off, I would risk damaging the contents of my hard disks and would almost certainly have to wait for hidden files to be rebuilt when I restarted. So I pressed the Power key which, in my mind's eye, I saw displaying an (invisible) dialogue, in which the default button produced an orderly shut-down. Pressing Return, it was a relief to hear the disks whine down as the Power Mac powered down, in perfect order.

The answer to getting the scanner to work was to remove the terminator and allow it time to complete its power-on self-test routines before turning the computer on. Well, it's reasonably standard, I suppose.

Dear Santa...

Top of this year's Christmas wish-list are those products for which I am still waiting: the Apple LaserWriter 12/640PS duplex printer, Internet Connection Kit and a faster Newton with a larger screen. The last is perhaps the most important as my old MessagePad is rapidly turning into a dead end: given more poke, a screen on which I can write and see more words and do useful sketches, it may be less pocketable, but it will be certainly more useful.

Next (but not first, because of its impossibility) is Mac OS 8. Not for its features but as tangible proof that, in the end, Apple can deliver. To go with it, there should be a sensitive port (to run native on the Power Mac) of Microsoft Word 4 and Excel 4. Both versions had achieved the zenith of their usability, providing good compromises with raw features. But now Word 6 torments me by seemingly being unable to select portions of words, often forcing me to resort to the delete key when the mouse could have done it better. Excel 5 is little better, turning graph production from a couple of mouse motions into an animated display of dialogue drama.



SoftQuad's HoTMetaL Pro 3 is a technically excellent web page editor but has not reached full WYSIWYG standard

Above all else, I would love to come downstairs on Christmas day to find a really good WYSIWYG web page editor: something technically brilliant like HoTMetaL Pro, with its extensibility and parsing potential, but which provided consistent tools for the direct manipulation of tables, frames and graphics. It is a sad indictment of the software industry that no-one has yet achieved this relatively easy goal despite more than ten years experience developing pre-press applications. Adobe's new version of PageMill promises to be a big step forward, but beta versions have had a rough and inconsistent interface and cannot be extended to cope with future enhancements to HTML. What we have to do now is comparable to having to embed raw PostScript in documents to be printed — quite unconscionable.

Ten Top SCSI Tips

1. Put a terminator at the far end of your SCSI chain. If the chain is short, it may work better without an external terminator.
2. Avoid using internally-terminated devices.
3. Check that all devices have IDs set between 1 & 6, and that none are duplicated.
4. Keep all cable lengths as short as possible.
5. Use only the highest-quality SCSI cables.
6. Make sure that all connections are home and secure before starting anything up.
7. Never connect or disconnect SCSI devices when any device is turned on.
8. Turn on all peripheral devices first and let them run up to speed before starting up your Macintosh.
9. Shut down your Mac first, before turning each SCSI device off in turn.
10. Keep a copy of SCSI Probe handy in case of problems.

Cheap programming

Macs have always attracted new and experimental programming languages, including Object Pascal (designed for Apple by Wirth) and the purely visual language Prograph (early 68K versions are now free).

There is no shortage of free or nearly-free development systems to enable enthusiasts to start creating their own programs. Among my current favourites are Concurrent Clean and Python. Concurrent Clean is a functional language with an impressive academic pedigree. It is remarkably efficient as far as functional languages go, and to demonstrate this a full-featured spreadsheet and nifty text editor have been written in Clean.

Python enables fuller access in a more conventional syntax (not unlike C) with objects, modules and more. Being interpreted, it is not quick, particularly when crunching numbers, but for this there are specialist mathematical languages, including MuPAD from the University of Paderborn which I will report on subsequently.

PCW Contacts

Howard Oakley loves to hear from Mac users. He can be contacted via the usual *PCW* address or on email as **howard@quercus.demon.co.uk** or **hoakley@cix.compulink.co.uk**

Apple Computer 0181 569 1199; web home pages **www.apple.com** and **www.-euro.apple.com**
System 7.5.5 is available as an update to 7.5.3 from **www.support.apple.com**.
Agfa Arcus II scanners (around £1,700); Agfa **0181 231 4200**
Concurrent Clean from **ftp.cs.kun.nl/pub/clean**
Python from **ftp.python.org/pub**
HoTMetaL Pro 3 from **SoftQuad 0181 387 4110**

Get going on **Win95**

Upgrading to Windows 95? Eleanor Turton-Hill guides you through the installation process and provides some hints on the operating system, too.

For those of you who have still not upgraded to Windows 95, here's a rough guide to help you through the installation process as well as some hints and tips to get you started with the new OS.

Installation requirements

Microsoft says that to install Windows 95, you'll need at least a 386 processor with 4Mb of RAM (Random Access Memory) and 35 to 45Mb of spare hard disk space.

In practice, such a machine chokes at the mere mention of Windows 95, and you can forget running any useful applications. I'd recommend a minimum spec of a DX2-66 processor with at least 8Mb of RAM and 50Mb of spare hard disk space.

When I say "spare" hard disk space, I mean enough free space to install the operating system. If you intend to install Microsoft Office or any other applications built specifically for Windows 95 then you'll need a decent amount of spare space on top of this if you're really going to benefit. Hard disks are pretty cheap these days, so its worth treating your aged PC to some extra breathing space in the form of a new 1Gb hard disk which will cost you just over £100 (plus VAT).

Windows 95 and the 32-bit applications which go with it are hungry for both hard disk space and memory, so when it comes to the RAM in your system, the same rules apply. The more you can get your hands on the better. The price of RAM has fallen considerably over the past six months or so, making upgrading more feasible for more people.

Preparing your system for Windows 95

There are a few clean-up tasks which it will pay you to perform before you start the installation program.

First, defragment your hard disk. This will rearrange all the free space on your hard disk into one uninterrupted area giving the new OS a clean start.

Next, check your system for viruses — if there are any lurking around, then now is the time to get rid of them. If anything goes wrong with your Windows 95 installation, you want to be able to eliminate viruses from the list of possible causes. Many common viruses can be identified and cleared using MSAV (Microsoft Anti Virus) which is included with DOS 6, but if you want to be thorough then use a third-party virus tool which is updated on a regular basis.

Make yourself a boot disk so that you can start your PC from the floppy drive if necessary. Do this by going to the FileManager in Windows 3.1. Insert a clean floppy into the a: drive and go to the Disk menu. Select Make System Disk from the menu and the essential system files will be copied to your floppy.

Left Windows 3.1 users, like myself, will be used to Alt-Tabbing back to the Program Manager to open new applications. Here I've set up a folder full of shortcuts to all my most commonly used applications. This can be left open all the time so that you can switch back to it

Right Each time you install an application, it is automatically added to the list in the start menu. The Task Bar at the bottom of the screen shows a minimised version of each application currently open

The installation program

Installing Windows 95 is a fairly self-explanatory process and the documentation is clear should you be unsure of anything.

If you're upgrading from Windows 3.1 then you should start the setup program from within Windows. Go to File and then Run from the Program Manager and type d:setup (if you're installing from CD-ROM). The initial Welcome screen appears and examines your system for the required amount of hard disk space. If you don't have enough, the installation will let you know early on in the process.

Its a good idea to install Windows 95 directly over your previous Windows installation unless you have vast amounts of spare hard disk space. That way, your existing applications will be set up and ready to use from Windows 95 when you've completed the installation. If you install Windows 95 in a separate directory, you will have to reinstall all of your applications before you can get started.

During the installation you will be asked if you want to save your existing system files. I'd strongly recommend that you answer "yes" to this as it makes the whole installation process reversible. Your old system files will take up about 6Mb of valuable space on your hard disk, which seems extravagant but is well worth doing. If Windows 95 fails to install correctly, you can get your Windows 3.1 system back — if it installs OK, then you can delete the 6Mb of system files.

Interface enhancements

The Windows 95 interface takes some getting used to and feels quite awkward at first. The Program Manager no longer exists and the File Manager has been replaced by the "Windows Explorer". When you Alt+Tab to move between applications, a box appears in the middle of the screen showing icons for all the applications you have open but you can't move back to the Program Manager to start up a new program because it doesn't exist anymore.

In Windows 95, everything hinges on the "Start" button on the Task bar. This gives you access to all the applications and utilities on your system via a series of menus. When you install a new application it is automatically added to the menu list.

The desktop is less cluttered in Windows 95 than in previous versions and the interface design is based on thousands of hours of usability testing and careful analysis of the tasks which all kinds of users perform. When you minimise applications, they sit on the Task Bar at the bottom of the screen so you always know exactly which applications you are running at any one time. The combination of the Start button and the Taskbar gives quick access to most common operations.

Here are a few tips which will help you to find your way around:

- Press F1 at any time to go into the Windows 95 Help system. This will display information which is relevant to your location on the desktop. You can also search the help system index for any subject area if you want a comprehensive explanation or a step-by-step list of instructions.
- Right-click on everything. The right mouse button is used extensively all around the desktop of Windows 95. If you're not sure what something does, right-click on it and you should find out by way of a menu or information box. Look out for the Properties option on menus as this allows you to change the appearance of objects on the desktop.
- Experiment with your desktop. The Task Bar can be dragged and dropped to any side of the screen, and you can force it to hide by clicking the Auto-hide check box.

Is Windows 95 a better operating system?

On the whole, the improvements incorporated into Windows 95 make it a more usable, more stable and more fully-featured OS. Two things you will benefit from straight away are the improved stability of the system when multitasking and better handling of system resources. One of the fundamental weaknesses of Windows 3.1 is that all applications, as well as operating system code, share a single address space called the system VM (Virtual Machine). The single address space model is bad news when it comes to system integrity because applications are not protected from each other and key portions of the operating system are left exposed to buggy programs and this can cause the entire OS to crash.

Ideally each application should be run in its own independent session, or VM, where it is protected from other applications and does not jeopardise the OS itself. When an application fails, the effect of the failure should be limited to the session in which it is running. Effectively, what VMs do is to protect the system against crashes by ensuring that applications do not write to each other's address spaces.

Windows 95 goes some way towards sorting this out by providing private address spaces for Win32 executables. Unfortunately, Win16 programs still execute as a single process within a shared address space and this means that one faulty 16-bit app can still bring down the whole system. Despite this, the new OS is generally a good deal more stable.

Here you can see that the files and folders showing in the Start Menu folder in the Windows directory are mirrored in the menu itself. So, you can edit the menu directly from Explorer

Go into the Display option in the Control Panel to control the colours, screensavers and wallpaper.

- Edit the Start menu, but don't bother with the Taskbar settings dialogue box. Instead, open up Explorer and take a look in the Start Menu folder in the Windows directory. All files and folders listed here are mirrored on the actual Start Menu. You can add new program icons to the menu simply by dragging and dropping.

Make use of shortcuts. Shortcuts provide a way of accessing an application, document or drive from the desktop without having to manually root around for it. All you need to do is drag and drop the executable file onto the desktop or right-click on the desktop and select New, ShortCut, and then Browse to find the file.

PCW Contacts

Eleanor Turton-Hill welcomes feedback and suggestions from readers. She can be contacted at **ellie@vnu.co.uk**

No-nonsense **Buyer's Guide**

Buying a **PC**

The one universal rule is that PCs get cheaper, better and faster all the time. The result is that your state-of-the-art PC can become outdated and old-fashioned in a couple of years. It may still work perfectly well, but it probably won't run very fast and won't run the latest software. If you're just planning to do simple word processing, this may not matter. But we're assuming here that you want to buy a general-purpose multimedia PC that can play games, use CD-ROMs and run a range of modern software.

Buying Don'ts

- Don't buy a machine with less than 16Mb of memory if you plan to run Windows 95.
- Avoid cheap 14in monitors.
- Bundled 14.4kb/sec modems are not the bargain they seem. Opt for 28.8kb/sec or one of the new 33.6kb/sec modems when they become available.

Buying Do's

- You can never have too much disk space. Spend extra cash on buying the next largest hard disk size.
- Make sure that Pentium motherboards have an Intel Triton chipset.
- Check the warranty. Is it for on-site or back-to-base repairs? If it's on-site, does the manufacturer offer guaranteed response times?
- Check the technical support. Is it free? Is it easy to contact?
- For home use, you'll probably want full multi-media capabilities to enable you to use CD-ROM games and edutainment products and play video clips. This should include at least a 16-bit SoundBlaster-compatible sound card and speakers.
- Think about ordering more memory. RAM prices are low at the moment but creping up — you can pick up 16Mb of EDO RAM for around £100 or less

Upgrading memory to 32Mb is also the quickest way to improve the performance of your machine — often more so than upgrading your processor.

- Look at the software bundle. If you want an office suite, it is far cheaper to buy it as part of the bundle. Larger manufacturers can offer MS Office, for example, at about one third of the RRP. Multimedia CD-ROM bundles will not include the UK version of Encarta '96 — Microsoft only allows the US version to be bundled.

Other things to consider

PCs have become similar in the last few years. The days when smallish computer companies designed their own chipsets (the chips that assist the computer's main processor) are long gone. Most small box-shifters buy their motherboards from Taiwanese manufacturers. Larger companies either design motherboards themselves (Apricot, Compaq, IBM) or get motherboards built by other companies to their specifications (Gateway).

Most manufacturers now use Intel Triton II chipsets: either 430HX or 430VX. The HX chipset is reckoned to be better for office applications and is optimised to work well with large arrays of EDO RAM. The VX chipset works best with multimedia applications and SDRAM.

Cyrix chips are worth considering. Their 6x86 chips, such as the P133+, are often cheaper and give better performance than their Intel counterparts.

If you are serious about multimedia, it may be worth upgrading your soundcard to a 16-bit wavetable card. A six-speed CD-ROM drive will give you a noticeable performance gain over a quad-speed, but the speed increase of an eight-speed over a six-speed is less tangible. Remember that unlike your hi-fi setup, good speakers are powered from the mains, not from your PC.

For up-to-date PC reviews, see our cover story, this issue.

•PCW Minimum specification

This is the absolute minimum spec we think you should consider if you're buying a new PC. It's suitable for general business use: word processing, databases and spreadsheets and, with the addition of a modem, for accessing the internet.

- Windows 95
- 100MHz Pentium processor
- 16Mb RAM
- Graphics card with 1Mb of memory
- 810Mb hard disk
- 3.5in floppy disk drive
- Quad-speed CD-ROM drive
- 14in colour monitor
- PCI local bus

•PCW Recommended specification

If you're not completely strapped for cash, this is the PC specification we recommend. No-one who works at *PCW* would settle for less.

- Windows 95/Windows NT 4.0
- Pentium 133MHz processor (a fast processor will make your computer run quicker and more smoothly)
- 256Kb secondary cache (again, this makes your computer run faster)
- 32Mb EDO RAM. 32Mb of memory speeds your PC up a lot, particularly if you're multitasking (using more than one application simultaneously)
- Graphics card with 2Mb of memory
- 2Gb hard disk — modern computer software takes up a lot of space
- 3.5in floppy disk drive
- Six-speed CD-ROM drive (video clips will play more smoothly; you will be able to access files on CD-ROM disks more quickly)
- 15in colour monitor (significantly easier on the eyes than a 14in version)
- 16-bit SoundBlaster-compatible soundcard
- Speakers
- PCI local bus

•PCW Best specification

Our Best Spec is as good a PC as you are likely to need for most software. For some specialist applications, like professional DTP or CAD, you may need to add even more memory, a bigger hard disk, a more powerful graphics card, or a larger monitor.

- Windows 95 or Windows NT4.0
- Pentium 200MHz
- 512Kb secondary cache
- 32Mb EDO memory
- 4Gb hard disk
- 3.5in floppy disk drive
- Eight-speed CD-ROM drive
- 17in colour monitor
- 4Mb VRAM or WRAM graphics card (this means your graphics card can display more colours and a higher resolution on your monitor: 16 million colours at a resolution of up to 1,280 x 1,024
- 16-bit wavetable soundcard
- Quality speakers
- PCI local bus

Buying a **Notebook**

Notebooks are one area in which it's often safer to stick to brand names. Not that some of the Far Eastern kit doesn't work perfectly well, but reliability seems to be a problem and it can be fiendishly difficult to obtain spares. A useful guideline when choosing a notebook is: try before you buy.

Remember that standard notebook specifications are generally a step or two behind the desktop equivalents.

What to look for in a notebook

- **Pointing device** There's been a wholesale move from trackballs to trackpads. Some notebooks, notably IBM Thinkpads, use stick technology (a device which looks like the rubber on top of a pencil and is controlled using one finger).
- **CD-ROM drives** are rapidly becoming standard in notebooks. If your notebook is going to be your only machine, it's worth getting one.
- **Floppy disk drive** Often there's a choice between a CD-ROM drive and a floppy disk drive. Again, if the notebook is to be your only machine, specify both. Otherwise, reinstalling an operating system can mean returning the machine to the manufacturer.
- **PC Cards** Modern notebooks all have at least one PC Card slot. They take credit-card-sized expansion cards which can add a fax-modem, a network interface card or even an extra hard disk to your computer.
- **Battery life** Battery life varies from as little as 30 minutes to over six hours. Lithium Ion and Nickel Metal Hydride batteries have now replaced the older NiCad (Nickel Cadmium) batteries.
- **TFT screens** TFT or active matrix screens are replacing the slower dual-scan or passive matrix screens. It means the screen image is refreshed far quicker.
- **Warranty** Drop a notebook and it may break, so it is vital to check the terms of your warranty. How long is it? What level of service is provided?

•PCW Minimum specification

Notebooks change rapidly. It's often possible to pick up end-of-line machines with 486 processors from brand-name manufacturers such as Toshiba and Compaq at discounted prices of £1,000 or less. These can be a very good buy. Just make sure they can run the software you need to use.

•PCW Recommended specification

- Windows 95
- Pentium
- Quad-speed CD-ROM drive
- 256Kb secondary cache
- 16Mb RAM
- On-board graphics with 1Mb of memory, PCI local bus
- 850Mb hard disk, 3.5in floppy disk drive and/or dual-speed CD-ROM drive
- TFT 800 x 600 screen

•PCW Best specification

The state-of-the-art notebook: either you're loaded, or your company's picking up the tab.

- Windows 95 or Windows NT
- Pentium
- 256Kb secondary cache
- 32Mb RAM
- On-board graphics with 2Mb of VRAM memory, PCI local bus
- 1.2Gb hard disk
- 3.5in floppy disk drive
- Quad-speed CD-ROM drive
- Active matrix 1,024 x 768 TFT screen
- Long battery life

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Glossary of Computing: **Important terms and acronyms**

A

Access time
The time it takes for a device to access data. The access time, quoted in milliseconds (ms) for hard disks and nanoseconds (ns) for memory, is usually an average as it can vary greatly. Together with the transfer rate, it is used to gauge the performance of hard disks and other devices. The lower the number, the better the performance.

Applications
An application, or package, is one or more programs used for a particular task. For example: word processing, invoicing or spreadsheeting. Applications are bought shrink-wrapped (wrapped in cellophane for general use) or custom-built for more specific uses.

ASCII (American Standard Code for Information Interchange)
Usually a synonym for plain text without any formatting (for example: italics, bold or hidden text). Since computers naturally use binary rather than Roman characters, text has to be converted into binary in order for the processor to understand it. ASCII assigns binary values to Roman characters. RTF, a Microsoft standard, adds extra formatting features to plain ASCII.

B

Backwards compatible
Compatibility of hardware or software to older versions of the product or standard.

Baud rate
The amount of data that can be sent along a communications channel every second. In common usage, it is often confused with bits per second. These days modem speeds are normally measured in bits per second. (See V* and Bit).

BIOS
Basic Input/Output System. Software routines that let your computer address other devices like the keyboard, monitor and disk drives.

Bit
Binary digit, the basic binary unit for storing data. It can either be O or 1. A Kilobit (Kbit) is 210 (1,024 bits); and a Megabit is 220, which is just over a million bits. These units are often used for data transmission. For data storage, Megabytes are more generally used. A Megabyte (Mb) is 1,024 kilobytes (Kb) and a Kb is 1,024 bytes. A Gigabyte (Gb) is 1,024Mb. A byte (binary digit eight) is composed of eight bits.

Bug (See Crash)

Boot
Short for bootstrap. Refers to the process when a computer loads its operating system into memory. Reboot means to restart your computer after a crash, either with a warm reboot (where you press Ctrl Alt Del) or a cold reboot, where you switch the computer off and back on again.

Bus
A "data highway", which transports data from the processor to whatever component it wants to talk to. There are many different kinds of bus, including ISA, EISA, MCA, and local bus (PCI and VL-bus).

C

Cache (See Memory)

COAST
Cache On A Stick.

CD-ROM
A CD-ROM is the same as a normal audio CD, except it can store data as well as sounds. A CD-ROM player can be attached to your computer to read information from the CD-ROM into the computer's memory in the same way that a domestic CD player reads information from the CD into your hi-fi. The advantage of distributing information on CD-ROM rather than other media is that each one can hold up to 680Mb of data — equivalent to some 485 high-density 3.5in floppy disks. The disadvantage, however, is that you can only write once on CD-ROMs, yet this makes them ideal for archiving.

CISC (See **RISC**)

CPU
Central processing unit. Normally refers to the main processor or chip inside a PC. (See Processor).

Crash
Common term for when your computer freezes. Can be caused by a power surge, a bug (which is a fault in software), or a GPF.

D

DRAM (See Memory)

DOS (Disk Operating System)
Once the standard operating system for PCs, it is now being replaced by Windows 95 and Windows NT.

DPI (Dots Per Inch)
Common measure of the resolution on a printer, a scanner or a display.

Drive controller card
An expansion card that interprets commands between the processor and the disk drives.

Drivers
Pieces of software that "drive" a peripheral. They interpret between the computer and a device such as a CD-ROM. If you have a SCSI CD-ROM drive connected, you will be able to use it on a PC or a Mac just by loading up the relevant driver on each machine.

E

EIDE (See IDE)

EISA (Extended Industry Standard Architecture)
A bus standard designed to compete with MCA. Now being replaced by PCI.

Electronic mail (E-mail, email)
Still the biggest single use of the internet. When you sign up with an ISP you are given an email address. Usually you can incorporate your name, or part of it, into your email address to make it easy to remember.

Expansion card
Circuit boards that fit inside PCs to provide extra functionality. For example, one might be an internal modem, providing the same functions as an external version (which is more common) but sitting inside the PC. Expansion cards are designed to be fitted and removed by people with little knowledge of PCs.

F

Floppy disk drive
Practically all PCs come with a floppy disk drive. 3.5in HD (high density) 1.44Mb floppy disks are now the standard. They come in hard plastic cases and have replaced the older, literally floppy, 5.25in disks.

Fonts
A font is an alphabet designed in a particular style. Fonts apply to both screen and printed letters. TrueType and Type 1 fonts are stored as shape descriptions, scalable to any size.

Format
To wipe a floppy or hard disk in order to prepare it to accept data.

G

GPF
General protection fault.

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Graphics card
An expansion card that interprets commands from the processor to the monitor. If you want a better, higher-resolution picture or more than your existing setup, you'll need to change your graphics card and/or your monitor.

GUI (Graphical User Interface)
(See Windows)

H

Hard disk
Sometimes called a fixed disk, hard disks are hermetically-sealed rigid disks able to store data and programs. Disk capacities increase all the time. The standard is now 1Gb but disks of up to 9Gb are available.

Hardware
All electronic components of a computer system, including peripherals, circuit boards and input/output devices.

HTML (Hypertext mark-up language)
The standard language used in the creation of web pages, that can be read by web browsers.

I

IBM-compatible
Originally meant any PC compatible with DOS. Now tends to mean any PC with an Intel or compatible processor capable of running DOS or Windows.

IDE
Integrated drive electronics. A control system designed to allow computer and device to communicate. Once the standard for PC hard disks, now being replaced by EIDE (enhanced IDE) which offers improved performance and extra features.

INTERNET
Millions of computers interconnected in a global network.

INTERNET SERVICE PROVIDER
ISPs provide access to the internet. You use your modem to dial the ISP's modem. The ISP has a high-bandwidth permanent connection to the internet.

IRDA
Infra-Red Data Association — the standard for exchanging data using infra-red, typically from PDAs or notebooks to a PC or printer.

ISA (Industry Standard Architecture)
This was the original bus architecture on 286 PCs. Also known as the AT bus (the 286 was known as the AT), it is still in use today. Slow by modern standards, but so widely accepted that expansion cards are still made for it. (See EISA, PCI).

ISDN (Integrated Services Digital Network)
A digital voice and data telephone network which looks set to replace the current analogue version. ISDN adaptors are already starting to replace modems as a fast way of accessing the internet and transferring data.

J

JPEG (See MPEG)

K

Kbit (kilobit), Kb (kilobyte)
(See Bit)

L

LAN (Local Area Network)
(See Network)

Local Bus
PCI (Peripheral Component Interconnect), developed by Intel, is now the standard for local bus architecture. It is faster than the older VL-Bus (Video Electronic Standards Association local bus) it replaces.

M

Macintosh (Mac)
A personal computer made by Apple and which is incompatible with PCs. Developed as a rival standard, its operating system looks like Windows, except that it pre-dates it and (in some people's view) looks and works much better.

Maths co-processor
A specialised chip that handles mathematical calculations (floating point operations) for the processor. Modern processors such as the Pentium have a co-processor built into them.

Mbit (megabit) (See Bit)

Mb (megabyte) (See Bit)

MCA
A type of bus designed by IBM to beat EISA. Although faster, it never became popular because every machine that used it had to pay a royalty to IBM, and because it was not backwards-compatible with ISA.

MPEG (Moving Picture Expert Group)
A standard for compressing video available in several flavours: MPEG 1, MPEG 2, MPEG 4. JPEG (Joint Photographic Expert Group) is a standard for still image compression.

Memory
The term normally refers to RAM (Random Access Memory). This is the kind that disappears when you turn off your computer and is much faster to access than a hard disk. It acts as a staging post between your computer's hard disk and its main processor.

• DRAM (Dynamic Random Access Memory)
This requires its contents to be replaced every 1/1000th of a second and is the most common form of memory in PCs.

• SRAM (StaticRAM)
Retains memory until the power is switched off.

• VRAM (VideoRAM)
Faster than DRAM, this is used by graphics cards.

• EDO (Extended Data Out RAM)
The latest type of memory. Offers improved performance.

Cache memory
Temporary memory set aside to store the information that is accessed most frequently. The Pentium processor has 8Kb of inbuilt cache. This can be further speeded up by a secondary cache, typically 256Kb. Part of your DRAM is often used to cache your hard disk.

ROM (Read-Only Memory)
A type of memory which can only be read: you can't make changes to it as you can to RAM. It is commonly used for things that will never need to be changed, such as the information the computer requires when you start it up.

Modem
The word is a contracted version of "modulator/demodulator", which means that a modem is a box (or, less commonly, an expansion card) that lets your computer talk over phone lines to other computers.

Monitor
Your computer's screen. Signals are sent to it from the video card.

Motherboard
The main printed circuit board which houses processor, memory and other components.

N

Network
A network is a group of computers linked together with cable. The most common form is a LAN (Local Area Network), where electronic mail and other files can be exchanged between users without swapping floppy disks. Printers and other resources can be shared. All the PCs on a LAN are connected to one server, a powerful PC with a large hard disk that can be shared by everyone.

O

OS (Operating System)
The operating system communicates with the hardware and provides services and utilities to applications while they run, such as saving and retrieving files.

P

Package (See Application)

PC Card
Formerly PCMCIA. A standard to allow PCs, particularly notebooks, to be expanded using credit-card sized cards.

PDA (Personal Digital Assistant)
Small electronic organisers. The Psion 3a is a typical example.

PCI (See Local bus)

PCMCIA (See PC cards)

Parallel ports
Used by your PC to communicate with the outside world, usually via a printer. Information can travel in parallel along a series of lines, making it faster than serial ports which can only handle one piece of information at a time.

Pixel
Picture element. The smallest possible addressable dot displayed on a monitor.

PowerPC
This family of RISC chips is the result of a collaboration between IBM, Apple and Motorola. It is now used in all Apple Macintosh computers and many IBM workstations.

Processor
The chip that does most of a computer's work.

Programs (See Applications)

Public domain
Software that is absolutely free. The author usually retains copyright but you can make as many copies as you want and pass them to other people. Public domain software often

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consists of small utilities which the author feels might be useful to other people. It is often confused with shareware.

Q

QWERTY
The name of a standard English-language keyboard, derived from the first six letters in the top row. The French equivalent is AZERTY.

R

RAM (Random Access Memory) (See Memory)
Reboot
(see Boot)
RISC (Reduced Instruction Set Computing)
These are starting to replace CISC (Complex Instruction Set Computing), as they're usually faster. The PowerPC chip is a typical example.
ROM (Read Only Memory) (See Memory)
RTF (Rich Text Format) (See ASCII)

S

SCSI
Small Computer System Interface is a bus that comes as standard in a Macintosh and is starting to rival EIDE on PCs.
Serial port
The serial port, of which there are sometimes two (com1 and com2) is used by your PC to communicate with the outside world. Serial ports are mostly used by modems and similar devices which communicate quite slowly. Some mice use them. Faster communications are achieved via the parallel port.
Shareware
A method of distributing software which is often used by smaller programmers rather than big software houses. It is freely available, but not free of charge. You are honour-bound to pay a small fee to the software's developer if you continue to use the program after a set period.
SIMM (Single Inline Memory Module)
The standard modules for memory expansion on PCs. Older 30-pin SIMMs have now been replaced by the 72-pin variety available in capacities up to 16Mb.

T

Tape streamer
Magnetic tape recorder designed for backing up data from your hard disk.

U/V

UART (Universal Asynchronous Receiver Transmitter)
Pronounced "you-art". A chip that allows your PC to cope with high-speed communications.
V34 Plus, V34, V32bis
A series of CCITT standards that defines modem operations and error correction. There are more than 20, but the key ones are:
• V32.bis, the standard for 14.4kb/sec modems.
• V34, the standard for 28.8kb/sec modems (see Baud).
• V34 Plus, the new standard for speeds up to 33.6kb/sec.
VESA (See Local Bus)
VGA
Video Graphics Array is the name given to a popular display. VGA graphics have 640 pixels horizontally and 480 vertically, and can display 16 colours. SuperVGA (SVGA) graphics can display 800 x 600 or 1,024 x 768 in as many colours as the memory in your graphics card will allow: up to 16.4 million, or true colour.
VL-Bus (See Local Bus)
VRAM (See Memory)

W

Windows
A GUI (Graphical User Interface) developed by Microsoft. Windows is supposed to make programs easier to use by giving them a standard, mouse-driven interface.
Windows 3.11 16-bit operating system.
Windows NT Robust, fully 32-bit operating system. Currently has the Windows 3.11 interface, but will soon be available with the Windows 95 interface.
Windows 95 Major improvement to Windows 3.11, with a redesigned interface. Less prone to crashes and easier to use, but requires more memory.
WINSOCK
Short for "sockets for Windows". The Winsock.dll is an extension for Windows which is necessary for connecting to TCP/IP networks.
WORLD WIDE WEB
A service on the internet which uses special software called Web Browsers (Netscape and Internet Explorer are the two best known ones) to give you access to pages of information with text, pictures and multimedia.
WYSIWYG
An acronym for What You See Is What You Get. What you see on the screen is exactly what you get when you print out your work.

Z

ZIF (Zero Insertion Force)
Sockets used for large CPUs. Lifting a handle enables you to remove the processor.
ZIP
The common standard for compressing files so that they take up less space. Zipped files have the extension .zip and are compressed and decompressed using shareware utilities such as Winzip and PKZIP.

How to choose an **ISP**

There are now over 100 Internet Service Providers, which makes selecting the right one a difficult task. Competition between them is now so fierce that many Providers are happy to offer a month's free trial.

All ISPs (Information Service Providers) allow you to send and receive internet email, browse the web and download files from internet servers. But there are differences between the extra services that each provides.

Large, centralised, online services such as AOL and CompuServe offer discussion areas and specialised content like online magazines and easily-searchable file libraries. Some providers allow you one email address per account while others offer you as many as five. Some charge a flat-rate for internet access while others charge extra if you exceed a specified number of hours online.

The quality of the software and technical support provided also varies. In general, the big "consumer" ISPs offer better support and more commercial software. The smaller, more basic, operations often offer cheaper deals.

Some ISPs are more geared up to business users who may need a fast ISDN connection and/or require the service provider to host or even design web pages for them.

Your chosen ISP can have a big effect on the performance of your internet connection, particularly in terms of access speed to US sites. Few ISPs provide local call access to anywhere in the UK. In London you'll have plenty of choice, but in the west of Scotland, say, the choice will be limited.

•PCW Recommended Products

Big, commercial ISPs. Not cheap, but easy to use, with plenty of extra services thrown in: **CompuServe 0800 289378; AOL 0171 385 9404**

Barebones service that's not for beginners but it does make your PC a full internet node in its own right: **Demon 0181 371 1000**

Another established service provider worth considering: **Easynet 0171 209 0990**

Buying a **Printer**

There are two main types of printer: laser and inkjet.

■ Lasers

Most office printers are lasers. They work much like photocopiers, and are cheap to run and print quickly. Their disadvantage is higher initial cost and mono output. Laser printers are available in all sizes and at all prices. Small desktop printers cost as little as £300. You can buy colour laser printers but they are still expensive, typically £5,000 or more.

■ Types of laser

PCs print by sending a description of the page to be printed down a printer cable. There are three commonly-used page description languages (PDLs):
• PostScript
This sends an outline in vector form (*see "Drawing Software"*) to the printer where it is rasterised (converted into dots) and printed to the device's best ability. PostScript is device-independent so that the image looks the same on a monitor (75dpi), a laser printer (300dpi) or a professional image-setter (2,400dpi).

• PCL
This stands for Printer Control Language, and it is Hewlett-Packard's alternative to PostScript, licensed to many clone-printer manufacturers. Printers using this tend to be cheaper than PostScript ones but output will vary from one machine to another, making it less suited to professional use.

• GDI (graphical device interface)
These printers download the description of your page already used by Windows straight to your printer. They will only work with Windows but are cheap and fast. They are also only suitable for a personal printer and will not work across a network.

•PCW Recommended Products

• **CHEAP LASERS** Epson EPL-5500: **Epson 0800 220546**; street price £300 (see *PCW* February '96)
• **SUB-£750 LASERS** Hewlett-Packard 5P: **Hewlett-Packard 01344 369222** (see *PCW* November '95)
• **NETWORK LASERS** Hewlett-Packard 5P: **Hewlett-Packard 01344 369222** (see *PCW* February '96)

■ Inkjets

Inkjets work by spraying ink onto paper. There are still some mono inkjet printers available, but it is best to stick with a colour inkjet printer as the price difference is negligible. They are cheap to buy but more expensive to run, and slower. Even cheap inkjets can print in good quality colour, especially on high-resolution paper.

•PCW Recommended Products

• H-P Deskjet 870CXi: **H-P 0990 474747;** street price £311.
• Lexmark 2070: **Lexmark 01628 481500;** street price £280. (See *PCW* November 1996).

■ Hybrids

For home use and small offices a hybrid could be the answer. They combine a printer, a fax machine and copying capability in one unit.

•PCW Recommended Products

Brother HL 730: **Brother** 0161 330 6531.£270.
Sharp JX 9210: **Sharp** 01753 819819. £209.
(see *PCW* January '97)

Buying a **Scanner**

Scanners are used to import text, graphics or pictures into a PC. They vary from low-cost hand scanners not much bigger than a mouse, to drum scanners costing thousands of pounds. The latter are designed to scan photographic transparencies to professional standards.

■ Flatbed scanners

The most common type, costing from £300 to over £3,000. They are capable of scanning colour pictures to a high standard. Most have transparency adaptors as optional extras.

■ Document scanners

A new category which aims to combine the reliability of flatbeds with speed and portability. They're intended for OCR and document management. Most will cope with photographs and some with colour, but it's not their forté.

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Buying a **Fax Modem**

You'll need a modem to connect to the internet or an online service, such as CompuServe or AOL, and also to send and receive email.

Modems are available in three formats: as PC cards to plug into notebooks, as external boxes, and as expansion cards. PC card modems cost the most and external modems cost slightly more than expansion cards.

Apart from the case and the external power supply, there's often little difference between the internal and external versions of a modem. Most modems now have fax capability built in, which means you can receive faxes on your PC to view or print out. If you're strapped for cash, a V32bis 14.4kb/sec modem is just about adequate. Better to buy a V34 28.8kb/sec modem or one of the new V34 Plus 33.6kb/sec modems.

•PCW Recommended Products

Fax-modems

• External — Hayes Accura 288 Message Modem **Hayes 01252 775 577** street price £145. (see *PCW* November 96, December 96).

•PCW Recommended Products

Flatbed Scanners

• Professional — Arcus II: **Agfa 0181 231 4200;** street price £2,600.

• Intermediate — Epson GTX 9000: **Epson UK 01442 61144;** street price £750.

• Budget — Umax Vista S6E: **IMC 01344 872800;** street price £299 (*PCW*, Sept '96).

•PCW Recommended Products

Document Scanners

• Visioneer PaperPort VX: **Computers Unlimited 0181 200 8282;** street price £299.

• Logitech PageScan Colour: **Logitech 01344 894300**; street price £299.

• Plustek PageReader 800: **Scan Direct 01292 671676;** street price £149 (*PCW*, March '96).

Buying a **CD-ROM Drive**

Just about the only things which differ on today's CD-ROM drives are their speed and means of connection. The most common connection is IDE or Enhanced IDE (EIDE). It is possible to connect an IDE CD-ROM drive to most existing IDE hard disk controllers. Older PCs may need a newer EIDE controller. IDE controllers are also found on many soundcards.

The first CD-ROM drives spun the disc at the same speed as an audio CD and were called single-speed, delivering a sustained data transfer rate of 150Kb/sec. Double-speed drives spun twice as fast, doubling the data transfer to 300Kb/sec, and quad-speeds twice as fast again, raising the transfer rate to 600Kb/sec.

Six-speeds are currently the standard (900Kb/sec), with eight-speeds (1,200Kb/sec) becoming increasingly common. All figures are theoretical maximums. Buyers should go for quad-speed or higher. There is little to choose between models, but off-the-shelf supplies are frequently short. Internal IDE quads start at

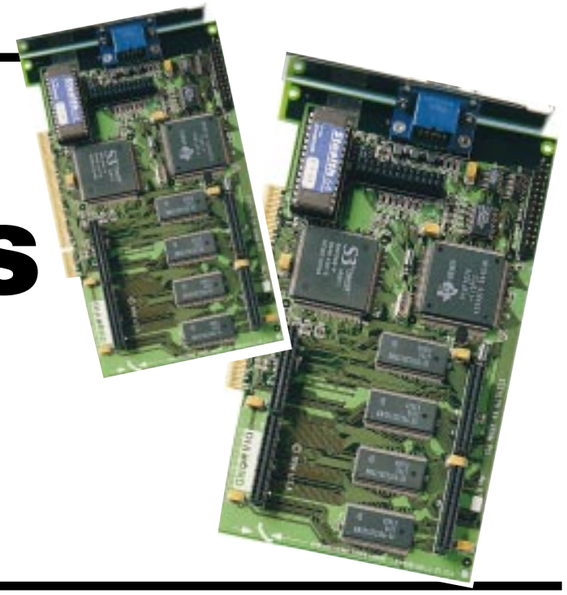
•PCW Recommended Products

CD-ROM Drives

• Teac CD56-E six-speed: fitted to many new PCs and costing around £85 (*PCW* January '96).

• The Goldstar 8X is a good eight-speed choice for around £99 (*PCW* Aug '96).

Buying a **Graphics Card**



The graphics card sits inside the PC and controls the features which the software can display on the monitor.

Check the amount of memory on the card. 2Mb is about standard these days, 1Mb is skimpy and 512Kb is barely usable. Better-quality cards are likely to be fitted with VRAM (Video RAM). Also, check out the performance capability of the card. Video cards come as 16-bit, 32-bit, 64-bit and even 128-bit: all you need to know is that a large number of bits means faster performance and more colours.

The most important aspect of your video card, and the most frequently quoted feature, relates to the resolution which the card supports in Windows. This is measured in terms of the number of pixels that the card displays on screen. The absolute minimum these days is 1,024 x 768 with a refresh rate of 70Hz.

A 2Mb card can display 16-bit colour (65,000 colours) at 1,024 x 768 pixels. A 1Mb card can only manage 8-bit colour (256 colours) at 1,024 x 768 pixels. To display 24-bit colour (16 million colours) at 1,024 x 768 you'll need 4Mb of memory.

The refresh rate (measured in Hertz) is important, too. It represents the number of frames displayed on-screen, per second. A flickering display is very tiring to use.

Finally, find out whether your video card is "local bus" or not. "Local bus" is a type of interface which connects your video card to the motherboard. It allows the memory in the card to be addressed directly by the CPU which makes it a lot faster than the standard ISA (Industry Standard Architecture) interface.

•PCW Recommended Products

Graphics Cards

• ATI Video Xpression: **ATI Technologies 01235 833666;** around £175 (see Graphics Card group test, *PCW* June '96)

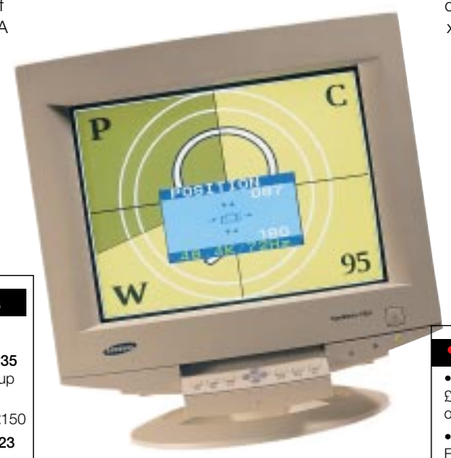
• Matrox Millennium: **Matrox 01793 441144** £150

• VideoLogic GrafixStar 600: **VideoLogic 01923 260511** from about £150

Buying a **Monitor**

Regardless of your computer application, you'll be looking at your monitor all day, so make sure you get a good one.

Some people claim not to see monitor flicker, but your brain will, resulting in fatigue and headaches. A refresh rate of 70Hz or higher will produce a flicker-free image on most monitors.



Interlacing also results in flicker. Always run in non-interlaced modes and ignore interlaced quotes.

The resolution refers to the number of dots (pixels) horizontally and vertically on-screen. Standard VGA mode runs at 640 x 480 pixels, while other typical modes include 800 x 600 and 1,024 x 768. The more pixels, the more you'll be able to fit on screen, but everything will be smaller and may only be suitable on a larger screen. Go for a 15in or 17in monitor capable of running a resolution of 1,024 x 768 non-interlaced at 70Hz or higher. The visible area of most monitors (and TVs for that matter) is smaller than the model implies: a 15in screen may only have a 14.5in visible area, and a 17in may have only 16in visible.

•PCW Recommended Products

• For a 15in screen: try the CTX 1569MS (around £300) or the NEC M500 multimedia (around £410 on the street).

• At 17ins there's the Sony 17sfII or the Taxan Ergovision 730TCO-S at around £500 (*PCW* July '96).

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Buying a **Sound Card**

You need one of these to add sound capability to your PC.

Check compatibility with your CD-ROM drive, and remember that 16-bit cards capable of 44KHz provide higher-quality sound than slower 8-bit cards. Better soundcards now include wavetable synthesis which means they have samples of real instruments held in ROM.

The quality of wavetable synthesis still varies widely. Even cheap cards which have the inferior Frequency Modulation synthesis should have a daughterboard connector allowing them to be upgraded to wavetable.

The newer cards are also plug and play which means, in theory, that you should be able to plug them straight into a PC without any extra configuration. Most cards are bundled with extra software, normally sequencers, wave editors and audio players.

• PCW Recommended products

- AWE-32: **Creative Labs 01245 265265;** £199 (*PCW,* April '96).
- Aztech SoundGalaxy Waverider Pro: **Aztech 01734 814121;** £79 (*PCW,* April '96).

Buying **Software**

Only a few years ago there were dozens of different software applications in each category. During the last two years or so, however, there has been rapid product consolidation. Other magazines list large numbers of packages, most of which are out of date and are not worth considering. We've distilled each category down to just one or two recommended products.

Software A-Z

A

■ ACCOUNTS SOFTWARE One of the few categories in which there are still masses of packages on the market at a huge range of different prices. Accounts is also one of the last bastions of DOS.
Recommended products: Lakeview LMS and Exchequor from SBS Systems.

C

■ CAD SOFTWARE Computer Aided Design covers everything from architectural drawings through office planning to complex engineering drawings.
Recommended products: AutoCAD, now at release 13, is still the industry standard. However, it's expensive and complex. For the casual user, Drafix QuickCAD is a cheap and accessible way to try your hand at it.

■ CONTACT MANAGERS (see PIMs)

D

■ DATABASE At its simplest, an electronic card index. For just a few hundred names and addresses, an electronic-type Filofax such as Lotus Organizer may be more appropriate. But for more sophisticated applications like tracking products and customers, the power of a relational database is required. Databases are generally the least user-friendly of the main suite applications. In most office environments you are more likely to use a database application that somebody else has written for you.
Recommended products: Lotus Approach, Microsoft Access.

■ DRAWING SOFTWARE Programs for drawing, that work using vectors. This means each shape drawn is described using mathematical equations.
Recommended products: At the budget end, GSP Designworks 3 stands out. At the professional end of things it's FreeHand 5 which gets our plaudits.

I

■ IMAGE EDITING SOFTWARE A program for editing bitmap files (files made up of pixels). Typically used for converting graphics files, retouching photographs and preparing pictures for printing.
Recommended product: For simple image editing the popular shareware program Paintshop Pro is fine. For professionals, Adobe's Photoshop is the industry standard.

■ INTEGRATED PACKAGES Typically these combine the functionality of a database, word processor and spreadsheet in one application. This makes it easy to move data from one component to another, but integrated packages tend to lack some of the advanced features of individual applications in the Suites.
Recommended product: Microsoft Works.

O

■ OCR SOFTWARE Optical Character Recognition software converts printed text into computer text you can edit. You will also need a scanner or fax card to get the printed text onto your PC. OCR saves re-keying documents and can cut down drastically on paper filing systems.
Recommended products: Omnipage is the

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best product we have found, but TextBridge offers most of the same capabilities for less cash.

P

■ PERSONAL INFORMATION MANAGERS (PIMs) PIMs are an electronic way of storing names, addresses, phone numbers and appointments. Contact managers take the idea one step further to include business information about dealings with clients.
Recommended products: Sidekick 95 and Organizer are excellent PIMs. For contact managers we recommend Goldmine for Windows.
■ PRESENTATION GRAPHICS Increasingly the trend is towards doing presentations on a PC and the latest packages tackle this by including sound, sophisticated transitions between slides and support for video clips.
Recommended products: Powerpoint and FreeHand are both capable products that are sold with Microsoft Office and SmartSuite respectively.
■ PROGRAMMING TOOLS Applications designed for writing software. These range from "low-level" languages which are powerful but difficult to learn and use, to "high-level" languages which, although much easier to use, generally sacrifice performance and flexibility in the process.
Recommended products: Delphi 2.0 is a great example of scalability, catering for beginners and serious developers working on major projects. Visual C++ is the pick of the high-end Windows development tools.
■ PERSONAL FINANCE PACKAGES These help you manage home finances. They're also well suited to some small businesses and tend to be easier to use than full-blown accounts packages.
Recommended products: Quicken is the outstanding product in this category and has no serious rivals.

R

■ REMOTE CONTROL SOFTWARE Software which lets you access and control a PC remotely, usually by using a modem.
Recommended products: ReachOut, for its simple interface and support for different networks, particularly TCP/IP.

S

■ SPREADSHEET An electronic version of an old-fashioned ledger. Ideally suited for balance sheets and sales figures. Excellent graphing and charting facilities are included nowadays.
Recommended products: Lotus 1-2-3, Microsoft Excel.
■ SUITES These days, most general business software (word processors, spreadsheets, presentation graphics packages) is sold in suites. Two suites are widely available: Lotus SmartSuite and Microsoft Office. If you buy them bundled with a new PC, they can cost £100 or less. Bought separately, they cost between £200 and £300. Lotus SmartSuite also contains a database. For Microsoft Office, you pay extra for Office Professional which contains Microsoft's Access database.
Recommended products: Microsoft Office is now close to the industry standard. Its high level of integration gives it the edge over the opposition.

V

VISUAL PROGRAMMING (see Programming Tools).

W

WORD PROCESSOR An application in which you write letters and reports or even produce a simple newsletter. The latest word processors have advanced features such as outliners, table editors and facilities for adding columns of figures.
Recommended products: Microsoft Word is the clear market leader. WordPro (formerly AmiPro) is a capable alternative.

A-Z of Recommended **Software Products**

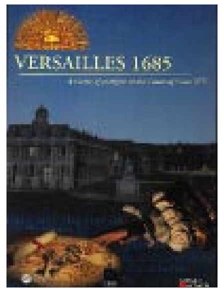
	Category	Product	Supplier	Contact	Price (Excl. VAT)	Date of PCW review
A	Accounts	Lakeview LM3	Lakeview Computers	0181 303 3329	£8,750	Jan '96
	Accounts	Exchequor	SBS Financial Systems	01202 298008	£5,980	Jan '96
C	CAD	AutoCad Release 13	Autodesk UK	01483 303 322	£3,150	Oct '95
	CAD	Drafix Quick CAD	Roderick Manhattan	0181 875 4400	£69	Oct '95
D	Database	Approach	Lotus	01784 455445	£99	Nov '96
	Database	Access	Microsoft	01734 270001	£220	Nov '96
	Drawing	Freehand 5	MacroMedia	01344 761111	£450	Apr '96
	Drawing	Designworks 3	GSP	01480 496789	£39.95	Apr '96
I	Image Editing	Photoshop	Adobe	0181 606 4000	£382	Dec '96
	Image Editing	Paintshop Pro	Digital Workshop	01295 258335	£49.95	Jun '95
	Integrated Package	Works	Microsoft	01734 270001	£79.99	Oct '95
O	OCR	Omnipage	Caere	0171 630 5586	£595	Nov '95
	OCR	Textbridge	Xerox Imaging Systems	01734 668421	£349	Nov '95
P	Personal Finance	Quicken	Intuit	0800 585058	£39.95 (Incl. VAT)	May '96
	PIM/contact manager	Organizer 2.1	Lotus	01784 455445	£99	Mar '96
	PIM/contact manager	Goldmine for Windows	Elan Software	0171 454 1790	£395	Mar '96
	PIM/contact manager	Sidekick 95	Starfish UK	0181 875 4400	£39	Mar '96
	Presentation graphics	Freelance	Lotus	01784 455445	£415	Nov '96
	Presentation graphics	Powerpoint	Microsoft	01734 270001	£220	Nov '96
	Programming tools	Visual C++	Microsoft	01734 270001	£379	Feb '96
	Programming tools	Delphi 2.0	Borland	01734 320022	249	Feb '96
R	Remote Control	Reachout	Stac Electronics	01483 740763	£110	Nov '95
S	Spreadsheet	Excel	Microsoft	01734 270001	£220	May '95
	Spreadsheet	1-2-3	Lotus	01784 455445	£365	May '95
	Suite	Office (Standard)	Microsoft	01734 270001	£360	Mar '96/Dec '96
	Suite	Office (Professional)	Microsoft	01734 270001	£460	Mar '96/Dec '96
W	Word Processing	Word	Microsoft	01734 270001	£220	Oct '96
	Word Processing	WordPro (AmiPro)	Lotus	01784 455445	£99	Oct '96

News

A right royal affair

History buffs and those who like climbing up greasy poles will enjoy Versailles 1685, from Cryo Interactive.

This 3D adventure game will immerse you in the regal world of art, music, protocol and conspiracy. Walk down the Hall of Mirrors and through the court in "Omni-3D". You'll be able to view the court in a full 360-degree perspective.



£39.99

Stallibrass 01869 345928

Censored Ace

"Hear No Evil" is now an option for the new Ace Ventura game from 7th Level. Parents will be able to censor the language and conversation of the game to make it more suitable for younger players.

The Pet Detective, Ace Ventura, looks for clues, interviews witnesses, and solves puzzles in a pure or, if you like, profane manner.

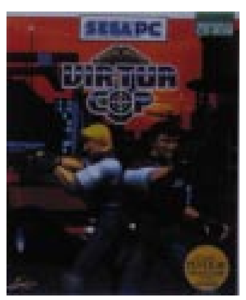
£34.99

7th Level 01932 355666

Licensed to kill

Sega's arcade game, Virtua Cop, has made the leap to the PC platform.

The fast-action 3D game has the same first-person-perspective gameplay as the original. Gamers looking for action can put their badge on the line to blow away crime bosses and save hostages.



The levels are generated in real time with viewing angles from left to right and up or down.

£39.99

Sega Europe 0181 995 3399

Get spooked

Gremlin Interactive has entered a new dimension of gameplay with the newly-released Realms of the Haunting, its new 3D interactive supergame.

With over 20 different Demon adversaries and 15 weapons, you won't be short of action, but you'll need more than a quick trigger finger to survive through all four CD-ROMs.

Considered better than Quake, Realms of the Haunting involves combat, exploration and puzzle-solving interspersed with over 90 minutes of high-res full-motion video. You can seek advice from different characters you meet along the way to help you survive this surreal experience.

It's available now, but watch out for *PCW*'s demo on February's cover disk.

£44.99

Gremlin Interactive 0114 275 3423

Charts

Level One

1	Wipeout 2097	Psygnosis	PlayStation
2	Championship Manager 2: 1996/97	Eidos	PC CD-ROM
3	Dark Forces: White Label	Virgin	PC CD-ROM
4	Championship Manager 2: Double Pack	Eidos	PC CD-ROM
5	Syndicate Wars	EA	PC CD-ROM
6	Tomb Raider	Sega	Saturn
7	Tekken 2	Namco	PlayStation
8	Flight Sim 6.0	Microsoft	PC CD-ROM
9	Formula 1	Psygnosis	PlayStation
10	Worldwide Soccer '97	Sega	Saturn
11	Worms United	EA	PC CD-ROM
12	Tie-Fighter: White Label	Virgin	PC CD-ROM
13	Fighting Vipers	Sega	Saturn
14	Indycar: White Label	Virgin	PC CD-ROM
15	Wallace & Gromit	BBC Multimedia	PC CD-ROM
16	Network Q Rally	Europress	PC CD-ROM
17	Tunnel B1	Ocean	PlayStation
18	Bubble Bobble & Rainbow Islands	Acclaim	PlayStation
19	Actua Golf	Gremlin	PlayStation
20	Civilization 2	Microprose	PC CD-ROM

Flight Simulator 6 for Windows 95

More joy for jet jockeys: new planes to fly to new cities with more detail, and it's all on the Windows 95 interface.

The long-awaited Windows 95 version of Flight Simulator has finally arrived. I had a list of niggles with the last version, so I was keen to see what Microsoft had been developing over the last year or so.

Flight Simulator 6 boasts many new cities including London, Paris, New York, San Francisco and Tokyo. All are rendered with good detail, and the new surface, enhanced textures of the land in-between, is more convincing than previous editions. The engine sound effects have been improved, especially when changing the position of the landing gear and flaps.

For those who like the larger, more commercial aircraft, the new Boeing 737 series 400 is waiting in the wings. Being a big fan of the more substantial airliner, I was keen to take it for a spin. I won't say that it's impossible to fly; just that I haven't exactly landed it yet — on the runway, that is. The characteristics of this plane are different to the other aircraft, as you might imagine. Because of its size, it's slow to react and then slow to stop reacting, which makes lining up for landing after banking round into final approach almost impossible. Still, practice makes perfect.

If all that lumbering mass has worn you out, get an adrenaline burst from the other new recruit, the Extra 300S, a nippy little high-performance aerobatics aeroplane. You can take this baby through its paces for sheer excitement, or you can learn how to do aerobatics properly with the famous female flyer, Patty Wagstaff, in the pilot's help flight school.

Installation is easy. Windows 95 starts the setup and progresses smoothly while displaying new features accompanied by aeroplane sound effects whizzing between the speakers. Your can select three types of installation: the first, a mere 40Mb of disk space, is ideal for notebooks. The second is "Typical", loading 85Mb in total. The last, "Custom", a massive 140Mb (probably most of the CD-ROM) is copied onto your hard disk which enables better scenery display and refresh.

Launching Flight Sim only takes seconds, like a usual Windows 95 application. Gone are the days of that extremely distressing DOS memory requirement message, often seen while loading previous versions.

The new Windows 95 interface is brilliant: all the preferences and situations are accessed within a true Windows environment, which makes the set-up far easier. Those of you with joysticks can now enjoy calibration within windows.

Well-presented online help files replace much of the old Pilot's Handbook, and

Above Fly the Boeing 737, a new recruit in the hanger
Left Happy landings!

there's a useful flight school provided by text display while the voice of instructors can guide you through the manoeuvres. The audio is particularly useful for freeing up your eyes and checking the dials.

I ran the game on a Pentium 133MHz PC with a lot of scenery detail loaded and it moved along quite quickly, except for the occasional momentary freeze while it read from disk.

Now I can say Flight Simulator is almost perfect thanks to its ease of use, extra detail and stability. The one downside was that it insisted on changing my graphics driver from a Diamond to a generic S3 after I switched into the preferred 256-colour mode, but this is only a small niggle.

Darrell Kingsley

PCW Details

Price £49.99 (incl VAT)

Contact Microsoft 0345 002000

System Requirements 486DX/66 or higher, Windows 95, 16Mb RAM, 40Mb hard disk space (min), double-speed CD-ROM, SVGA card, and 16-bit sound card.

★★★★

p530 ➢

Network Q RAC Rally Championship 5

Realistic rallying in fully-specced cars, spitting gravel all the way.

I love arcade-style driving games. The last decent driving game for the PC was Gremlin's Fatal Racing, but this has been toppled from its throne by the superb Network Q RAC Rally Championship, from Europress.

The only game to be officially endorsed by the RAC Motorsport Division, Network Q RAC Rally features all 28 stages of the RAC Rally — just under 300 miles of the official RAC route. Choose from six fully-specified rally cars: Subaru Impreza Turbo, Ford Escort Cosworth 4x4 Turbo, Renault Maxi Megane, Proton Wira, VW Golf GTi 16 Valve, and Skoda Felicia, all with sound effects recorded from the genuine vehicles.

Put your foot down and overtake that Cosworth

The realism is to be applauded: it could be sunny and dry, chucking it with rain or pitch black, and Rally will make you feel like you're actually there. The cars are animated beautifully, the road and landscapes look great, and the handling of the vehicles is convincing as you slide around a wet gravelly corner. Beware of the over-enthusiastic computer cars flipping and blocking the track.

Sound effects and music tracks are excellent, and there's samples of TV's rally commentator Tony Mason yelling co-driver route advice. It ran beautifully in high-resolution mode on a 16Mb Pentium 166, but Rally requires at least a 486 DX2/66 with 8Mb RAM to make it worthwhile. As you'd expect, you can race against the computer, or with up to eight players over a network in four modes of play.

Rally is easy to get into, it's addictive, and offers tougher levels for the experienced gamer. Perfect for the rally enthusiast or any arcade driving fanatic.

Gordon Laing

PCW Details

Price £39.99 (incl. VAT)
Contact Europress 01625 859333
System Requirements 486 DX2/66 or better, Windows 95 or DOS 6.22, 8Mb RAM, SVGA graphics with 1Mb memory, 2x CD-ROM drive.
★★★★★

Monopoly

A CD version of the well-loved game.

When I was young I loved playing Monopoly, especially against my sister as I always won. However, one day she caught me with my hand in the bank and refused to play me ever again. I swear to this day that it was the first time I had ever done this. But the damage was done — she never trusted me again.

She wouldn't trust this new electronic version of the property-trading game. It gives you an option of letting the computer cheat, which presumably means it can dip into the bank's vaults without you noticing.

Apart from that, Hasbro's online interpretation of Monopoly is faithful to the original. It adds annoying music and 3D animations of your piece moving around the board, and some idiosyncratic interpretations of the famous landing sites. Oxford Street is depicted as an idyllic mountain scene and Whitechapel Road looks like it's been hit by a nuclear strike. The playing area is small and cannot run full-screen. I pity anyone who ends up squinting at their 14in monitor.

Watch the dice roll and your players move. Always keep an eye on the banker

Playing the game is a doddle. Select which piece you want and choose your opponents — either the built-in AI players, other humans or a remote player on the net. Then you simply click on the dice, wait for the character in the top hat to throw, and watch your piece move around the board. Then it's up to you to buy or defer.

As Brucie would say, that's pretty much all there is to it. Playing Monopoly this way was cool, but I missed the banknotes and property cards stuffed under the board and the plastic hotels and houses. I can move my racing car faster than any 3D animation.

PJ Fisher

PCW Details

Price £39.99 (Incl. VAT)
Contact Hasbro Interactive 0181 569 1234
System Requirements 486 DX/33 with 8Mb RAM, 13-27Mb of hard disk space, Windows 3.11 or Windows 95.
★★

Starting from scratch

Tony Sale wanted to prove that the electronic computer was a British invention, not American, so he rebuilt the Colossus, originally used to crack Nazi codes. Simon Rockman reports.

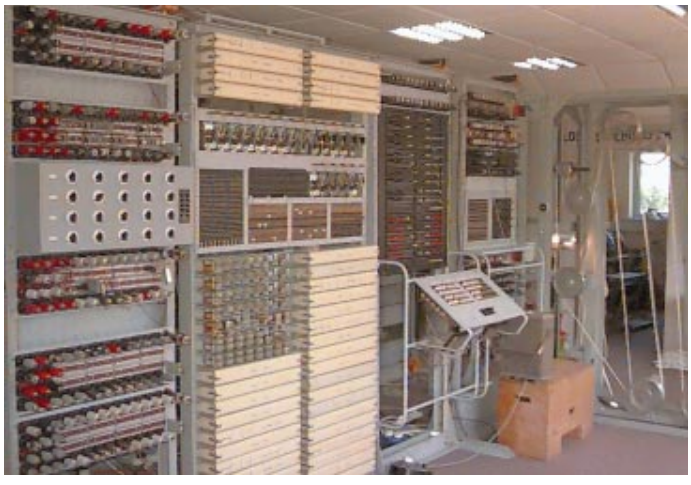
Tony Sale was a man with a mission: one which is now complete but spiced with technology and patriotism. He wanted to prove that the electronic computer was a British invention, so to this end he rebuilt the first-ever computer, at its home just outside Milton Keynes. In doing so, he proved that Britain was two years ahead of America, which had previously claimed its ENIAC machine was the first.

The man who originally built Colossus, and thus the first person to build a computer, was Dr Tommy Flowers, together with his team at the Post Office Research Laboratories at Dollis Hill, north London. The original Colossus was built in 1943 and was operational by February 1944. It wasn't a computer as we know it. It had one job: to crack codes from the German Lorenz SZ42 cipher machines. Some of the programming was completely hardwired (part of the design of the machine) and some was changeable, using plugs and sockets. There was no software.

Not all the code cracking was done by Colossus; a good deal had to be done by hand. The Lorenz SZ42 used the international 5-bit Baudot teleprinter code and enciphered the text by adding two characters to it, successively, before transmission. This technique relied on random numbers for the two characters, but distributing books or tapes of the random characters was difficult in the middle of a war and prone to interception. So the Germans designed the Lorenz machine with a complicated set of mechanical gears to give a possible 10^{18} combinations.

They reasoned that to try all these combinations by hand, when there was a lot of coded traffic, would take so long that the information would be redundant by the time the code was cracked. As a result, the German high command (from Hitler downwards) thought Lorenz was uncrackable. But the interception and deciphering of their messages gave allied generals vital information prior to, and after, D-Day.

Ten machines were eventually built, each one taking about two hours to crack the wheel settings. Colossus was technically digital (although it had no clock speed), its actual processing speed governed by the 5,000 characters per second of the optical tape reader which used five-hole paper tape. This essentially made the machine a parallel processor, since the operations took place together. The information was held in valves as five characters of five bits in a shift register. Each possibility would need up to 100 operations to be performed on the number. Special hole combinations indicated the beginning and end. The need to store 501 bits for the L2 Lorenz valves meant there were 2,500 valves.



The Colossus, the world's first digital electronic computer, could break German codes varying up to 10^{18} combinations, all with vacuum tubes. Not bad hitting for the first of its kind!

In these days of 3.3v computers, the Colossus lives up to its name in power usage alone. It takes between +200v and -150v (to power the Logic as well as the tape reader) and consumes 4.5kW of power. The machine is huge. The room it fills would now be considered large enough for the computer department of a multinational corporation.

Rebuilding a machine which had been kept secret, and whose original plans had been destroyed in 1960, was no mean feat and cost Tony Sale many thousands of pounds as well as two years' of hard work. He began with a series of official photographs, taken in 1945. The first stage was to produce accurate machine drawings of the Colossus frames. This involved three months' of eyestrain poring over the photographs and using 3D projections to transfer the details to a CAD system called EasyCad, running on a 486 PC. The optical paper tape reader system was not shown in any of the photographs but Sale managed to locate Dr Arnold Lynch, who designed the reader system in 1942. "Although well into his eighties, Dr Lynch came to my house and, using my CAD system, we re-engineered the reader system to his original specifications," says Sale. ■

● *If you have parts: EF36, 37 or 37A pentodes, 6J5 triodes, 6V6 tetrodes (should be the large glass versions to look right) or GT1C gas-filled triode thyratrons, the 6J5's and 6V6's; please send any contributions, valves or money to Tony Sale at The Colossus Rebuild Project, 15 Northampton Road, Bromham, Beds MK43 8QB. (Phone 01234 822788 or email TSale@qufaro.demon.co.uk)*

Brainteasers

Although this is the January issue, I am aware that most of you get your copy of the magazine in early December, so Happy Christmas and a great New Year to you all.

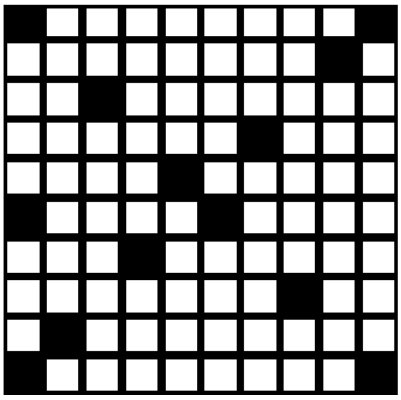
Quickie

Here is the usual not-too-difficult number puzzle to do over the party season. One chocolate bar costs three times as much as a candycane. If I buy one chocolate bar and one candycane, and the sum of the digits of the total number of pence that I spend is 14, how much change will I get from a pound?

This Month's Prize Puzzle

Arrange the numbers shown *(right)*, into the grid — some across and some down — in the manner of a crossword.

When you've done that, cut out (or photocopy) the completed grid and stick it on a postcard, or onto the back of a sealed envelope, and send it to: *PCW Prize Puzzle January 1997, P.O. Box 99, Harrogate, North Yorkshire HG2 0XJ.* Entries should arrive no later than 20th January 1997.



42	8352	3782749
52	8899	6544048
68	9135	8908619
85	9913	9395813
266	23654	16039438
631	32412	18345788
654	32700	25783688
695	228947	29561997
843	318990	44594632
1195	786951	63603022
2433	969921	89283259

October 1996 Prize Puzzle

The problem about the distances from the Baron's house in gallimeters was a little bit harder than usual and, as a result, just under 90 entries were received in all.

I realised, from the entries, that two answers were possible, depending on which direction the cyclists took. Anyway, the answer I wanted was ten gallimeters, but I was willing to accept the alternative, equally correct, answer of 243.1 gallimeters.

The winning entry came from Mr J Connolly of Plymouth. Congratulations, Mr Connolly, your prize will be with you shortly. To all the others — keep trying, you could be the next winner.

JJ Clessa ■

Computations

Soaring on tax dollars

Imperial Airways, forerunner of BA, flew on a subsidy of £380,000 plus a year. British buses today pay four times more for fuel than BA. US federal spending on major companies' aerospace programmes nearly doubled in the 15 years running up to GATT. Success in space exploration was patchy, with a 12.6 percent failure rate overall. 144 out of 1,154 US spacecraft failed to achieve orbit. Boeing is planning to cash in by launching up to 1,000 satellites from a converted oil-rig in the mid-Pacific. Should it not be paying back out of its annual turnover, which is bigger than Egypt's, some of the public funding it has received?

What a gas

Keeping the average American comfortable in Hollywood-type surroundings takes the equivalent of seven Olympic swimming pools of gas a year. Each American's average share of US energy consumed in 1990 was 328 million Btu. Per capita energy consumption has decreased by 0.6 percent since 1970, but the consuming population has increased by 53 million, or 25 percent. Humanity has used 1,100 trillion cubic metres of gas, which would fill Olympic swimming pools stretching to the moon and back 28,000 times.

■ Sources: Statistical Abstract of the US/Donella Meadows: Amicus Magazine

Statellite

If the British Film Institute raises the £20 million it wants from lottery funds and puts its 275,000 archived movie and TV titles online, a film student could watch a different clip every five minutes of the working day for 13 years. ■ Source: BFI

Power surge

It has been calculated in California (by the Air Resources Board) that 10 percent of smog-forming non-automotive hydrocarbons come from personal consumer products. About 2,600 products are involved, including cleansers, fixatives and aerosol insecticides. I have not seen a similar calculation for electrical appliances, which are subject to no controls at all, with the result that their use is, er, out of control.

A chilling thought

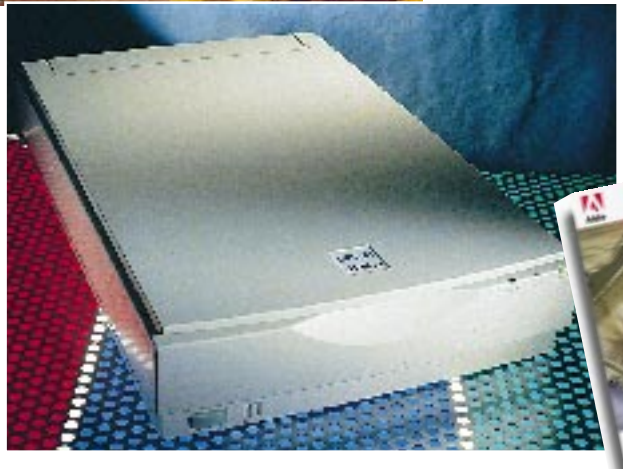
Statistics show that in 1985 Americans bought 2.9 million air-conditioning units, but in 1989, they bought 4.9 million.

The 70 percent increase must be proof of the greenhouse crisis. It partly reflected the building programmes in the sun-belt, but also demonstrated the vicious circle of electrical cooling: A/Cs export heat to the outside, making warm towns and cities warmer, prompting more people to install air-conditioning. A/Cs boost demand for coolants, most of which are ozone-layer destructive and increase electricity consumption. This forces the climate change people seek to escape. Heat exchangers and adaptive architecture are the only way to redevelop sun-belt suburbs.

Desktop Publishing **Extravaganza**

Epson "Colour in-Colour out" competition

Print out your creations with the Epson Stylus Color 500 printer after scanning the image on the GT-5000 scanner. For those dippy about DTP, Adobe PhotoShop and PageMaker are essential prizes



Who says you can't have it all! In this month's *PCW* competition, Epson is giving away the all-in-one home DTP package worth over £600.

With the Epson GT-5000 scanner, you can scan up to 24-bit colour with an optical resolution of 300dpi (output to 2,400dpi). An Epson Twain Utility is present to guide the novice through the process. Also included are the software packages Corel PhotoPaint 5, CorelDraw 4, and more.

But the fun doesn't stop there. With this prize you'll be able to print out all and sundry creations with the Epson Stylus Colour 500 inkjet printer. Capable of printing out 720x720dpi full colour, you'll be able to print out the family photos or any DTP project you want.

To enter this outstanding competition, all you have to do is correctly answer the following question.

■ What utility has Epson included with the GT-5000 to help novice users? Is it:

a) **The Mark Twain utility**
b) **The Epson Twain Utility**
c) **The Twain Spotting Utility**

Adobe £3000 Software Give-away

For those DTP and photo retouching aficionados who like to be on the cutting edge of graphic design, you won't want to miss out on this contest.

Adobe is giving away three Photoshop 4.0 and three PageMaker 6.5 software packages worth a total of £3,000.

Photoshop 4.0 is perfect for a serious designer. This full 32-bit MMX-enabled package can skew, scale, rotate, re-colourise and zoom-in (up to 1,600%) on an image. PageMaker 6.5 is the ultimate layout designer's tool. Updated to include HTML and WWW support, it's meant to help any repro person keep up to date. You'll be able to lay out that family or office newsletter, or that big-time magazine publication you've been pondering.

■ For a chance to win one of these six superb software packages, just tell us what HTML stands for. Is it:

a) **Hyper Tools for Managing Links**
b) **How To Make Links**
c) **HyperText Mark-up Language**

Write your answers on a postcard or the back of a sealed envelope, along with your name, address and daytime telephone number, and send to: *PCW* January Competition, CMS Ltd, P.O. Box 11312, London WC2H 0DJ. Entries must arrive by 16th January 1997.

Note: If you do not wish to receive promotional material from companies other than VNU Business Publications, please specify this on your competition entry.

Rules of entry

This competition is open to readers of *Personal Computer World*, except employees, and their families, of VNU Business Publications, Epson and Adobe. The Editor of *PCW* is the sole judge of the competition and his decision is final. No cash alternative is available in lieu of prizes.

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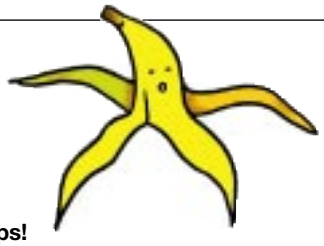


Oops!

■ The Hayes Optima V.34+ Fax PC card review in last month's modem group test stated that it came with an EZJack connector. This is only available with the US versions, not the UK ones. We regret any confusion this may have caused.

■ Novell's phone number was printed incorrectly on page 164 of our last issue. It should have been 01344 724000.

Techie humour

How many technical support staff does it take to change a light bulb?

1. "Well, we have an exact copy of your light bulb here and it seems to work fine. Can you be more specific about the problem?…"
2. "I'm sorry, we don't support that kind of lighting technology."
3. "Our engineers are busy at the moment…We have assigned query number 7869800783 to your question and will call you back within half an hour."

Ten for the Ladies

Ten reasons why computers must be male:

1 They have a lot of data but are still clueless.

2 A better model is always around the corner.

3 They look nice and shiny until you bring them home.

4 It's always necessary to have a back-up.

5 They'll do whatever you say if you push the right buttons.

6 The best part of having one are the games you can play.

7 In order to get their attention, you have to turn them on.

8 The lights are on but nobody's home.

9 Big power surges knock them out for the night.

10 Size does matter.

Mythical tales

A computer once billed a man for $0.00. He dutifully wrote to the company telling them about this absurd bill and they promised to correct the problem. But the next month, he got another bill for $0.00.

This went on for months. The computer thought he'd defaulted on the bill so a five percent penalty was added, bringing the total to, you guessed it — $0.00.

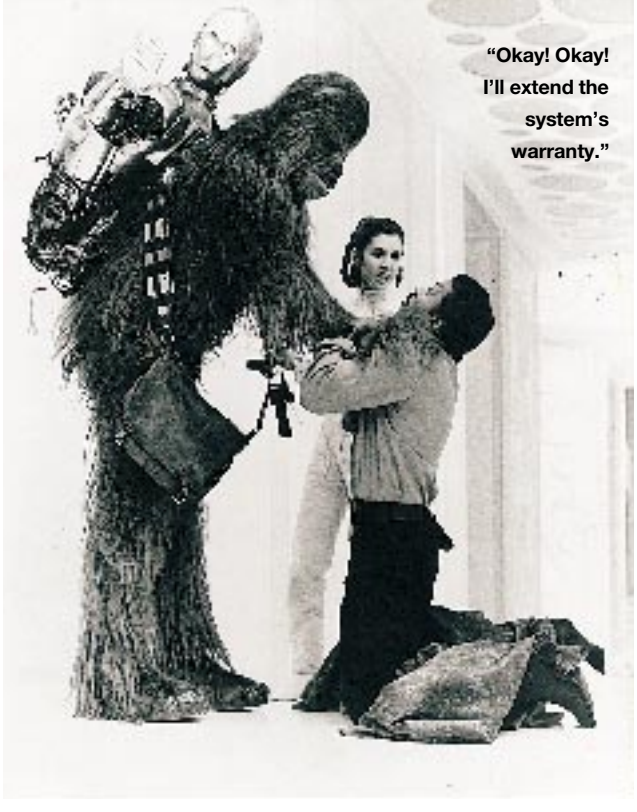
Calls and letters to the company failed to correct the problem. Finally, the man gave up and wrote a cheque for $0.00 and the bills ceased.

■ *Thanks to Steve Oualline*

Caption competition

Congratulations to Caption winner Brian Salter, of London, who won November's Caption competition (lady with rolling pin) with this: "OK, wise guy. Gimme the dough for a flatbed or I'll let you have a taste of my handheld."

Think you can do better? Email captions@vnu.co.uk or write to the usual *PCW* address with your own captions on a postcard marked "Captions Compo", before 18th January. We'll print the funniest entry and the winner will get a £20 book token.



"Okay! Okay! I'll extend the system's warranty."

Just fancy that…

PCW news editor Clive Akass was pleased to be invited to a Microsoft developers conference in California recently. A highlight of the conference was a speech by Bill Gates. Bill, it turned out, was being beamed live by satellite from 6,000 miles away. In fact, from the Lanesborough Hotel in London, which is all of one mile from the *PCW* office...